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FIG. 1. The Mona Lisa.

The Genesis of Mona Lisa*

KENNETH D. KEELE**

LEONARDO da Vinci personifies a tragedy of genius. Misunderstood in his own day for thinking some centuries ahead of his fellows, five hundred years later he is entombed as a "classic" too ancient to be of any use to modern man. Well might he weep those hemiplegic tears that stained his last days in Amboise. For he saw his fate.

Today it is doubly perilous to embark on interpretations of Leonardo's works; not only does one risk being engulfed in the oceanic breadth and depth of his thought, but the zeitgeist of our age decrees ever-narrowing tubular fields of intellectual vision, each the province of a specialist, and our law permits prosecution of those who trespass. There is only one specialty left which can claim exoneration from this offence, that of the practising doctor whose speciality consists of seeing human life in the whole. The doctor's acquaintance with art and science in medicine can teach him to know the value of each, and his knowledge of artists and scientists after all is part of his profession. Since it is by a physician that this fresh interpretation of Leonardo's portrait of the Mona Lisa is being made, it is encouraging to find a predecessor in Dr. Sigmund Freud, whose fruitful conclusions justified at least his own attempt.

For some 450 years this portrait has presented its diagnostic problem to the world and during this time it has been "interpreted to death," always with lavish use of such words as "mystery" and "secret," terms which betray the jejeune nature of the interpretation. The solution of the problem of Leonardo's Mona Lisa must lie in that fusion of scientific and artistic insight so peculiar to his genius.

It is proposed to examine the Mona Lisa's portrait and to assess the evidence in regard to an interpretation of her secret as pregnancy.

* The Beaumont Lecture of the Beaumont Medical Club, New Haven, Connecticut, 9 December 1958.

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THE HISTORY OF MONA LISA

"For Francesco del Giocondo Leonardo undertook the portrait of Mona Lisa, his wife, and left it incomplete after working at it for four years."[1] Such is the sum of Vasari's information of the model of the portrait. A few more facts about her have been ascertained.[2] Born in 1479 in Naples, daughter of Antonio Gherardini (probably a branch of the Florentine family of that name), she was married at the age of 16 in 1495, becoming the third wife of Francesco del Giocondo, then aged 35. This man was no Florentine nonentity, for in 1499 he became one of the twelve Buonomini of Florence. In this same year, a little daughter by his wife, Mona Lisa, was buried in Santa Maria Novella. It is possible that a son, Bartolomeo del Giocondo, was born to her, but whether or not this boy was the son of one of Francesco's two previous wives is not certain.

In 1500 Leonardo da Vinci returned to Florence from Venice and commenced Mona Lisa's portrait. It is said by some that Leonardo undertook the portrait on his own initiative—that she was one of those persons he sought out as expressing some fascinating trait which he wished to portray. Be that as it may, at this time Leonardo was importuned by Isabella d'Este and other fair ladies for portraits, all of which he refused. Some reason impelled him to choose the relatively unknown wife of Francesco del Giocondo as his model; and it is certain that neither money nor fame supplied the incentive.

It would appear that Mona Lisa sat for her portrait intermittently for four years, a period during which Leonardo amongst other things went campaigning with Cesare Borgia, entered into problems of geology, mathematics, and anatomy, undertook his technically disastrous portrait of war, the Battle of Anghiari, and attempted the diversion of the River Arno behind Pisa. Through all this the Mona Lisa simply sat still, and by so doing entered the company of immortal women. Then she fades into the shades; the only uncertain trace of her suggests that she died a year or so later in the obscure town of Lagonegro.

Two points in this brief narrative need emphasis. First, Mona Lisa was chosen by Leonardo, as possessing, above other women,

1 Vasari, Giorgio. *The lives of the painters, sculptors and architects.* Tr. by A. B. Hinds.

2 Müntz, E. *Leonardo da Vinci, artist, thinker, and man of science.* London, 1899, p. 416 ff.

some feature of over-ruling significance which attracted him. What was this feature? Secondly, Mona Lisa was 21 years of age when Leonardo first saw her, and she had already lost a small daughter; evidence that she was at this time again pregnant, whether with a son Bartholomeo or some other child, remains inconclusive.

Examination of Mona Lisa

Posture. The first striking feature on examination of the Mona Lisa is her posture. She sits well back in a comfortable arm chair, her back straight and well supported. One can see that as she sat down she placed both arms along the arms of the chair, gripping their ends; on her attention being attracted to the artist on her left, she has raised her right arm, turned her body slightly to the left, placing the right hand over the left which still lightly grips the end of the chair-arm. The body movement is heavy and slight, the neck movement greater, bringing more of her face into view.

Anyone who has watched a woman heavy with pregnancy sit down and turn to one side will recognise the adoption of this beautiful pose. The pregnant woman sits well back in her chair in order to straighten that lordotic curve of the spine so fatiguing to the spinal muscles in the latter half of pregnancy. At the same time she holds herself erect to gain freedom of movement for breathing; to lean back would shift the abdominal burden on to the diaphragm and impede its movement. For a similar reason the weight of the arms is laid along the arms of the chair, so freeing the upper chest for the free thoracic breathing characteristic of pregnancy. The suggestion of pregnancy embodied in this posture is strongly reinforced by the outline of Mona Lisa. Remembering that she was about 21 years old when the portrait was commenced, one is immediately struck by the "matronly" outlines of all parts of her body. This is certainly not the ideal Florentine beauty of Leonardo's day; this is not the type of maiden he sketched so often in his notebooks. The face is so round and broad that Müntz describes it as "full cheeked almost puffy." It suggests the fullness of the later months of pregnancy. Her full neck reflects the thyroid enlargement apparently common in Florentine women of that time, but particularly prominent in pregnancy. The fullness of her breasts was recognised in Antonina

Vallentin's description of her,[3] "dress, drawn tightly over her full breast."

The outline of her abdomen is skillfully concealed by her posture and the play and fall of her robes. But in spite of these concealing folds draped over her right arm and swung over her left shoulder, clear evidence of her abdominal size remains in the heavily vertical line of her dress dropping into her lap, and filling out all the expected concavity of the waist line. For a contrast with regard to this line one has only to glance at Raphael's imitation of the Mona Lisa in his sketch and portrait of Maddalena Doni. Here is the figure of a fat loose-fleshed woman who is not pregnant. In spite of flabby cheek and ample bosom her converging waist-lines form so striking a contrast with those of Mona Lisa's waist as to leave little doubt as to the significance of her abdominal shape.

The lightly crossed hands of Mona Lisa have called forth a loud chorus of praise through the centuries for their shape and their posture. Their shape is noteworthy for unusual fullness as compared with other hands of women drawn by Leonardo. It is sometimes said that the complete dearth of any earlier studies for this portrait is broken by a drawing of hands at Windsor. Exquisite as these are, they provide clear visual evidence of Leonardo's sensitiveness to the hand's bony configuration and make angular contrast with the smooth rounded beauty of Mona Lisa's hands, filled out, like her face, with that extra tissue-fluid so common in pregnancy. And like so many women in this state she has removed all her rings—a feature noted by many writers. Of the posture of the hands Heydenreich has written: "Leonardo . . . invented this form of lightly crossed hands which in its simplicity and naturalness imparts great serenity as well as a sense of completeness to the portrait."[4] This "invention," its very newness, is surely part of Leonardo's solution of the problem which he had undertaken, that of portraying the beauty of pregnancy in woman.

The smile more than any other feature has been thought to be a fusion of elements from both Mona Lisa and Leonardo. If she is pregnant, this "transition from expressionless quiescence to first expression" as Heydenreich describes it, reflects the placid

[3] Vallentin, A. *Leonardo da Vinci; the tragic pursuit of perfection.* Tr. by E. W. Dickes. London, 1952. p. 355 ff.

[4] Heydenreich, L. H. *Leonardo da Vinci.* London, 1954, pp. 48-52.

satisfaction of pregnancy, over which moves joy in gratified creative power, like a ripple in a pond. To assess the element of Leonardo in it needs understanding of his emotional life-pattern.

Leonardo's Emotion for Mona Lisa

There seems little doubt that the portrait of the Mona Lisa inspired Leonardo himself with deep emotion. The portrait was apparently never delivered to Francesco del Giocondo, on the grounds that it was unfinished, grounds which sound suspiciously like an attempt on Leonardo's part to keep it by him indefinitely. This in fact he did, taking it with him to France during the last years of his life, whence it found its way into the French King's collection. These events strongly recall Leonardo's own comments on the power of a portrait for retaining the presence of an absent beloved one.

Granting this emotional involvement, one is induced to ask what was its nature. Opinion appears unanimous in denying any liaison of a sexual nature between the two. Contemporary and later gossip significantly enough carries no breath of such scandal, probably in recognition of the fact that Leonardo was not attracted in this way to women. If this then was not the emotional bond, what was? Freud's study[5] of Leonardo's emotional pattern carries us a long way towards the answer.

It is well known that Leonardo was the bastard child of a peasant girl Caterina and the young notary Ser Piero da Vinci. Immediately after Leonardo's birth, the young Ser Piero was married to the respectable and kind Donna Albiera Amadori. Leonardo was left with his lonely mother for some five years, after which Ser Piero and Donna Albiera, realising that they were going to be childless, took into their house the attractive little Leonardo, and saw that his mother Caterina was married off to a cowherd in the village.

During these five years, according to Freud, Leonardo living with his abandoned mother became "over-loved" by her; upon her his infantile sexuality was absorbed with abnormal intensity, with resultant life-long mother fixation, an emotion which was expressed throughout his life as passionate curiosity, a curiosity which dominated all other urges. Women throughout his life became significant as mother figures to Leonardo; here lay their

[5] Freud, S. *Leonardo da Vinci; a psychosexual study of an infantile reminiscence.* Tr. by A. A. Brill. New York, 1932.

interest and attraction for him from his early days in Verrocchio's studio. Vasari relates how he attained early success in terracotta heads of "smiling women and children" and the subject of the madonna and child though fashionable at the time is mentioned so often amongst Leonardo's commissions and projects all through his life that one cannot but sense the attraction the motif bore for him. At the very time he was painting the Mona Lisa he was also engaged on the most emphatic picture of motherhood of his life, the Saint Anne, with Virgin and Child, which contains two mother figures reminiscent of his own two "mothers," and these women's faces, as well as that of the Mona Lisa bear that smile which contained for him the essence of creative and tender woman. The difference between them lies in the stage of their motherhood. The Mona Lisa's smile before the birth of her child does not carry the same blissful sweetness of that of the Saint Anne looking down on her divine offspring; it is more earthly and less spiritually sublime, wherein lies its impression of power—even, as Pater felt, of sinister power. That this smile held for Leonardo the memory of his mother is Freud's interpretation of it, though in attributing its "sinister" element to her "robbing him of normal sex," Freud seems to step beyond the probable. Freud's hypothesis of Leonardo's mother fixation depends on his interpretation of Leonardo's recollections of infancy, when "a kite came to me and opened my mouth with its tail, and struck me several times with its tail inside my lips." Though much of the speculation on the significance of these words depends on his mistranslation of the word "nibbio" into "vulture" instead of "kite," Freud's general thesis of Leonardo's mother fixation illustrated by this reminiscence is not invalidated by this error.

That the Mona Lisa is a portrait of a pregnant woman did not occur to Freud. Had it done so he would have found further evidence for identifying her with Leonardo's mother. For it is not only her smile, but her whole person which is transmuted into that mother symbol upon which Leonardo's intense emotion was focused.

LEONARDO'S INTELLECTUAL INTEREST IN THE MONA LISA

If Freud's interpretation of Leonardo's emotional patterns is correct, it is not to be expected that the focus of his love would escape his penetrating intellectual curiosity. Indeed we have it not only from Freud, but in Leonardo's own words—"the love of

anything is the offspring of knowledge, love being the more fervent in proportion as knowledge is more certain. And this certainty springs from a complete knowledge of all the parts which united compose the whole of the thing which ought to be loved."[6]

The procreation of man was of interest to Leonardo from his earliest anatomical studies, which were planned to illustrate the formation of man from coition and conception to parturition. Beside his well-known coitus figure he writes, "I display to men the origin of their second—first, or perhaps second, cause of existence."[7]

> Anatomy must begin [he writes], with the conception of man, and describe the nature of the womb, and how the foetus lives in it, up to what stage it resides there, and in what way it quickens into life and feeds. Also its growth, and what interval there is between one stage of growth and another. What it is that forces it out of the body of the mother, and for what reason it sometimes comes out of the mother's womb before due time.[8]

If the Mona Lisa is a study of pregnancy, evidence of concentrated study on this subject is therefore to be expected in Leonardo's notes; it is in his anatomical, not his art, books that preparatory sketches for the portrait will be found. Not only do such studies exist, but the greater part of them have recently been dated by Esche,[9] Clark,[10] and O'Malley and Saunders,[11] into the period 1500-1504, the very years in which he was engaged upon the portrait of Mona Lisa.

The best known of Leonardo's anatomical illustrations, a map of the abdominal viscera (situs figure) dates from these years (Q.I.12r). This page is described by O'Malley and Saunders as "illustrating the general physiology and anatomy of the female, perhaps to constitute an introduction to the embryological section of his proposed work." And in relation to the illustration of the uterus these authors say: "It [the uterus] is a globular or piriform structure of exaggerated size possibly to indicate the organ in

6 Leonardo da Vinci. *Quaderni d'anatomia* . . . Pubblicati da ove C. L. Vangensten, A. Fonahn, H. Hopstock. Christiania, 1911-1916. 6 vols. vol. II, 14r. [Referred to in text as Q.]

7 *Ibid.*, vol. III, 3v.

8 *I manoscritti di Leonardo da Vinci della Reale Biblioteca di Windsor:* Dell'anatomia, fogli B. Pubblicati da T. Sabachnikoff . . . Torino, 1901. (See also MacCurdy, E. *The notebooks of Leonardo da Vinci;* arranged by E. MacCurdy, New York, 1938. vol. I, p. 189.)

9 Esche, S. *Leonardo da Vinci, das anatomische Werk.* Basel, 1954.

10 Clark, K. *A catalogue of the drawings of Leonardo da Vinci in the collection of His Majesty the King, at Windsor castle.* Cambridge, 1935.

11 *Leonardo da Vinci on the human body:* the anatomical, physiological, and embryological drawings; with translations, emendations, and a biographical introduction by C. D. O'Malley and J. B. de C. M. Saunders. New York, 1952.

pregnancy."[12] This suggestion is supported by the exaggeration also given to what Leonardo describes as "menstrual veins which go to the breasts." In Galenical physiology these veins carried the menses, retained during pregnancy, to the breasts, where they were converted into milk. On the same page Leonardo writes, "Your series shall be with the beginning of the formation of the child in the womb, stating which part of it is formed first, and so successively putting in its parts according to the periods of pregnancy until birth and how it is nourished, learning partly from the eggs laid by hens (Q.I.12r)."[13]

From this note it is evident that Leonardo had not at that time embarked extensively on his anatomical investigation of the pregnant state, thus the more detailed drawings of the infant in the womb were made later. It would be typical of his approach to the study of any natural phenomenon, if, at this preliminary stage, he made an artistic illustration of pregnancy, such as the portrait of a pregnant woman.

In another anatomical study of this period (Q.III.1.v)[14] the pregnant female figure is drawn from the left side, the enlarged breasts and the lordosis so often productive of the backache of pregnancy are beautifully shown, proving how well Leonardo realised that a pregnant woman would want to sit upright in her chair to straighten this curve—in the position in fact adopted by Mona Lisa.

Beside this drawing Leonardo writes, "The child lies in the womb surrounded by water, because heavy objects weigh less in water than in the air. . . . Further the water distributes its own weight together with the weight of the creature over the entire base and sides of the womb." (Q.III.1.v) These words show Leonardo thinking along the same lines as on another occasion, when, discussing the weight of water, he asks, "Why does a vase in the air weigh more when full of water than when full of air? . . . And the sea does the same upon its vase the earth, and the shores uncovered to the air are the lips of the vase that receives it. . . . (B.M.266v)."[15] Here one sees how Leonardo's consistent mind perceived problems common to the seas of the earth and those of the womb within which the child lies. One can glimpse in this example the intense reality for him of the analogy between macro-

12 *Ibid.*, p. 456.
13 MacCurdy, E. *Op. cit.*, vol. I, p. 172.
14 Leonardo (note 11), p. 454.
15 MacCurdy, E. *Op. cit.*, vol. II, p. 103.

cosm and microcosm and perceive the relationship he saw between primeval seas amongst the mountains and those within the body of Mona Lisa in her pregnancy.

The deep significance he attached to the analogy between the greater and lesser worlds is also evident in his projected plan of anatomical studies—"Therefore there shall be revealed to you in fifteen entire figures the cosmography of the 'minor mondo' (the microcosmos or lesser world) in the same order as was used by Ptolemy before me in his cosmography." And of these fifteen entire figures "three also must be devoted to the female body, and in this there is great mystery by reason of the womb and its foetus. . . . (Q.I.2r)"[16]

Leonardo's admiration for the process of human genesis may be felt in his following description of it: "Though human ingenuity may make various inventions answering by different machines to the same end, it will never devise an invention, more beautiful, more simple more direct than does Nature; because in her inventions nothing is lacking, and nothing is superfluous. She needs no counterpoise when she creates limbs fitted for movement in the bodies of animals, but puts within them the soul of the body which forms them, that is the soul of the mother, which first constructs within the womb the shape of man, and in due time awakens the soul that is to be its inhabitant. And this at first lay dormant under the tutelage of the soul of the mother who gives it life and nourishment through the umbilical vein with all its spiritual members, and this will continue as long as the said umbilical cord is joined to it by the secundines and the cotyledons by which the child is attached to the mother."[17] (Q.IV.10r)

On the same page of manuscript on which is to be found his well-known drawing of an infant in the womb he also outlines the figure of an infant within its waters enclosed in the amnion. Perhaps this subject particularly fascinated Leonardo since he was reputed to have been born "in the caul," i.e., before the membranes ruptured, to give passage to "the waters." Be this as it may, he twice notes the possibility of birth with intact foetal membranes.

In another passage he repeats his view that it is the soul of the mother that shapes the body of the infant into the shape of man, a repetition which endorses his intense interest in the sub-

[16] *Ibid.*, vol. I, p. 168.

[17] *Selections from the notebooks of Leonardo da Vinci.* I. A. Richter, Ed. London, 1952, p. 163.

ject. "The heart of this child does not beat, nor does it breathe because it continually lies in water. If it breathed it would drown, and breathing is not necessary because it is vivified and nourished by the life and food of the mother. This food nourishes this creature not otherwise than it does with other portions of the mother, that is the hands and feet and other members. One and the same soul governs the two bodies, and the desires, fears and pains are common to this creature as are all other nervous parts . . ."[18] (Q.VI.8r) It is an index of the way Leonardo's mind was working that at the top of this page of manuscript is the memorandum "Book 'On the Water' to Messer Antonio."

These examples from Leonardo's notes not only carry conviction of his interest in pregnancy, but they confirm that this interest was intense during those very years in which he was painting the portrait of Mona Lisa.

It is a well-known feature of Leonardo's life that his early curiosity concerning natural phenomena often arose in the service of his art; later it would become converted into that intellectual form we term scientific research. It is most unlikely that Leonardo, whilst making these studies of pregnancy, would fail to appreciate to the full its effects on the body of woman, for these appearances pre-eminently provide a subject falling within the sphere of what he called the creative "science" of painting; and this subject above all, if we accept Freud's judgment, was that which aroused in Leonardo the most intense emotions of which he was capable.

With both intellectual and emotional sides of his mind so strongly stimulated it becomes very difficult to believe that Leonardo should have omitted the genesis of man from artistic representation. Yet there exist from his hand no other portraits of a woman in pregnancy apart from this of Mona Lisa.

EXAMINATION OF THE BACKGROUND

Although it seems almost ridiculous to suggest that Leonardo painted the background of mountains and lakes in the picture of Mona Lisa merely for decorative effect, no more satisfactory interpretation of their significance has yet been offered. This is not surprising when it is realised how little attention has been given to Leonardo's conception of the formation of the earth and the analogy so vital to him between the macrocosm of the world and the microcosm of man. It is necessary therefore to give a brief

[18] Leonardo (note 11), p. 474.

résumé of Leonardo's concept of water as the blood of the living world, before attempting interpretation of those geological features in the background of the portrait of Mona Lisa.

The movement of water was for Leonardo the key to the life of the world and man. Water is at once the arch-creator and destroyer of the world. Water is the driver of nature—"Without it nothing can exist among us. . . (B.M.57v)."[19]

"The cause which moves the humours in all kinds of living bodies contrary to the natural law of their gravity, is really that which moves the water pent up within them through the veins of the earth and distributes it through narrow passages. . . . Out of the lowest depths of the sea the water rises to the summits of the mountains, and finding there the veins burst open it falls through them and returns to the sea below. Thus within [the earth] and without it goes, ever changing, now rising with fortuitous movement and descending in natural liberty. . . . (C.A.171r).[20]

In similar words, Leonardo many times describes this "circulation" of the waters of the earth. Every time he emphasises its changing qualities as it circulates, "now keeping new essences or qualities, showing itself now deadly, now life-giving."

This conception of the circulation of water, rising up as mists sucked up by the sun, is to be found in Aristotle's Meteorologica—a book referred to by name at least three times in Leonardo's notes. To Aristotle also may be traced the concept of the earth containing large quantities of water which are similarly drawn up inside the earth to the mountain tops, where they burst out as springs to form the rivers.

In Leonardo's time the universe and our world were still considered to exist in the form of four "elements" arranged concentrically, the innermost sphere of earth being surrounded by water, outside which were spheres of air and fire.

Water is by weight the second element that encompasses the earth, and that part of it which is outside its sphere will seek with rapidity to return there . . . It is its nature to search always for the low-lying places when without restraint. Readily it rises up in steam and mist, and changed into cloud falls back again in rain as the minute parts of the clouds attach themselves together and form drops. . . . (A.26r).[21]

Heat for Leonardo is the agent that moves water upwards against its "natural" movement of descent by gravity, both in the earth and animals.

19 MacCurdy, E. *Op. cit.*, vol. II, 98.
20 *Ibid.*, vol. II, p. 14.
21 *Ibid.*, vol. II, p. 21.

Where there is life there is heat, and where there is vital heat there is movement of vapour. This is proved because one sees that the heat of the element of fire always draws to itself the damp vapours, the thick mists and dense clouds, which are given off by the seas and other lakes and rivers and marshy valleys. And drawing these little by little up to the cold region, there the first part halts . . . and so all the parts joining together . . . form thick and dark clouds . . . So the same heat which holds up so great a weight of water as is seen to fall in rain from the clouds sucks it up from below the roots of the mountains . . . and confines it among the mountain summits, and there the water finds crevices, and so continuing it issues forth and creates rivers. (A.54v) [22]

This circulation Leonardo applies to the movement of blood in man—indeed it was this application which obscured from him the true mode of circulation of the blood as discovered by Harvey some 120 years later.

I say that it is just like blood which the natural heat keeps in the veins at the top of the man, . . . and as the sun warms the man's head the amount of blood there increases, and it grows to such an excess there . . . as to overload the veins, and frequently to cause pains in the head. It is the same with the springs which ramify through the body of the earth and, by the natural heat which is spread through all the body that contains them, the water stays in the springs and is raised to the high summits of the mountains. . . . (A.56r) [23]

This analogy between the physiology of the macrocosm and the microcosm of man is systematically elaborated by Leonardo in the commencement of his treatise on water:

Man has been called by the ancients a lesser world, and indeed the term is rightly applied, seeing that if man is compounded of earth, water, air and fire, this body of the earth is the same; and as man has within himself bones as a stay and framework for the flesh, so the world has the rocks which are the supports of the earth; as man has within him a pool of blood wherein the lungs as he breathes expand and contract, so the body of the earth has its ocean, which also rises and falls every six hours with the breathing of the world; as from the said pool of blood proceed the veins which spread their branches through the human body, in just the same manner the ocean fills the body of the earth with an infinite number of veins of water. In this body of the earth there is lacking, however, the sinews, and these are absent because sinews are created for the purpose of movement, and as the world is perpetually stable within itself no movement ever takes place there, and in the absence of movement the sinews are not necessary; but in all other things man and the world show a great resemblance. . . . (A.54v) [24]

The conception of a live world is also developed in this treatise on water:

[22] *Ibid.*, vol. II, p. 22.
[23] *Ibid.*, vol. II, p. 23.
[24] *Ibid.*, vol. II, pp. 21-22.

Nothing grows in a spot where there is neither sentient, fibrous nor rational life. The feathers grow upon birds and change every year; hair grows upon animals and changes every year. . . . The grass grows in the fields, the leaves upon the trees, and every year these are renewed in great part. So then we may say that the earth has a spirit of growth, and that its flesh is the soil; its bones are the successive strata of the rocks which form the mountains; its cartilage is the tufa stone, its blood the springs of its waters. The lake of blood that lies about the heart is the ocean. . . . And the vital heat of the world is fire which is spread throughout the earth; and the dwelling place of its creative spirit is in the fires, which in diverse parts of the earth are breathed out in baths and sulphur mines, and in volcanoes, such as Mount Etna in Sicily. . . . (Leic. 34r) [25]

If such is Leonardo's concept of the "living" body of the earth, what has he to say of its genesis? His conception of the nature of the earth was revolutionary heresy—"The earth is not in the centre of the circle of the sun, nor in the centre of the universe, but is in fact in the centre of its elements . . . (F.41v)."[26] "All your discourse points to the conclusion that the earth is a star almost like the moon, and thus you will prove the majesty of our universe . . . (F.56r)."[27] "The earth . . . has lost a considerable amount of the ancient light in our hemisphere by the lowering of the waters. . . . (F.69v)"[28] Here Leonardo refers to his idea that the light of the world (and the moon) are due to reflection of the sun from their waters. The earth in its elements was originally enveloped in water. "It must needs be that the water is more than the land; but the part uncovered by the sea does not reveal it; it must needs be therefore that there is a great mass of water within the earth, in addition to that which is diffused through the lower parts of the atmosphere and runs through the rivers and springs . . . (Leic. 36r)."[29] He suggests how this may have come about.

I perceive that the surface of the earth was from of old entirely filled up and covered over in its level plains by the salt waters, and that the mountains, the bones of the earth, with their wide bases, penetrated and towered up amid the air, covered over and clad with much high-lying soil. Subsequently the incessant rains have caused the rivers to increase and by repeated washing have stripped bare part of the lofty summits of these mountains. . . . And the earth from off the slopes and lofty summits of the mountains has already descended to their bases, and has raised the floors of the seas which encircle these bases. . . . (C.A. 126v.b)[30]

25 *Ibid.*, vol. I, p. 91.
26 *Ibid.*, vol. I, p. 298.
27 *Ibid.*, vol. I, p. 299.
28 *Ibid.*, vol. I, pp. 301-2.
29 *Ibid.*, vol. I, p. 373.
30 *Ibid.*, vol. I, p. 335.

In this way the waters descending from the mountains to gain the ocean form

> valleys which were formerly in great part covered by lakes, because their soil always forms banks of rivers, and by seas which afterwards through the persistent action of the rivers cut through the mountains; and the rivers in their wandering courses carried away the high plains enclosed by the mountains; and the cuttings of the mountains are shown by the strata in the rocks which correspond to the sections made by the said courses of the rivers. . . . (Leic. 1.v) [31]

That Leonardo understood the stratification of sedimentary rocks is clear; moreover, he considered this movement of water to be the main power underlying the formation of the earth. But this word picture from Leonardo's own notes also aptly describes the mountains and lakes which fill the background of the portrait of Mona Lisa. Here he depicts his interpretation of these panoramic scenes. He illustrates the shaping of the earth by that driver of nature, water; the process of creation of the earth, its genesis by and from water; and in its embrace he inserts the form of Mona Lisa.

Leonardo's grand hypothesis is founded, as might be expected, on many observations, some personal, gleaned from the mountains of Tuscany and Lombardy, others obtained from travellers in distant parts of the world. He cites examples which explain the formation of great land masses of the world, ranging from the Rhone Valley in France, the Ganges Valley in India, to the formation of his own native valley of the Arno.

Working in a limestone country Leonardo was made keenly aware of the part played by water-hollowed caverns in the formation of the earth, and he considered that in some parts the earth must have subsided: "A very large space of the earth which was filled with water, that is the immense cavern, must have fallen in a considerable distance from its vault towards the centre of the world, finding itself pierced by the course of the springs, which continually wear away the spot through which they pass. . . . (Leic. 36r)"[32] This form of "subsidence of lands as in the Dead Sea in Syria," accounted in his view for some lands and seas being below the level of the ocean. In a passage describing the formation of land round the Black Sea he writes:

[31] *Ibid.*, vol. I, p. 347.
[32] *Ibid.*, vol. I, p. 372.

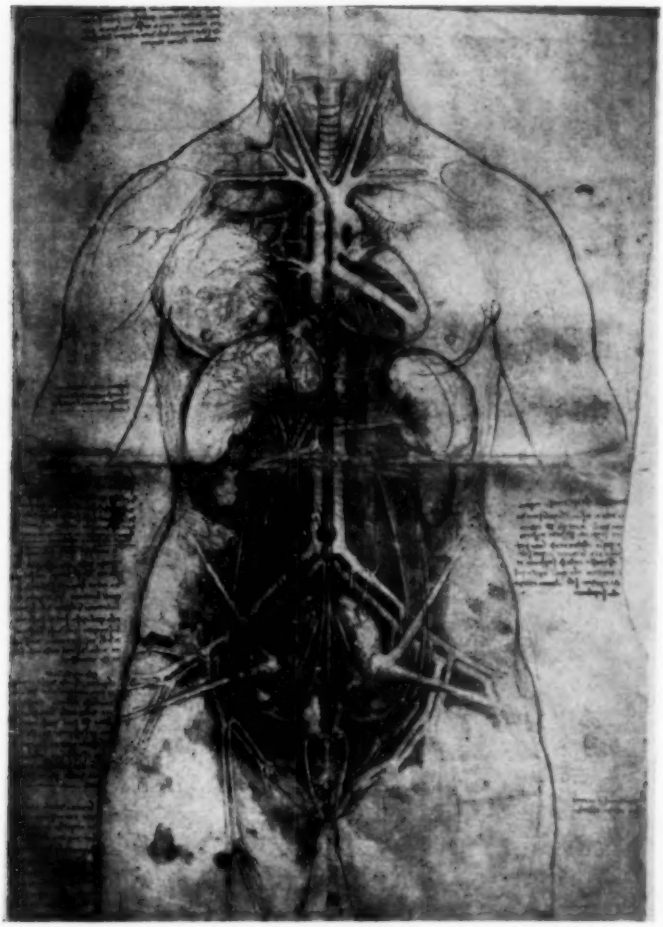

FIG. 2. Leonardo's situs figure (Quaderni 1.12.r.). This well-known anatomical study of the viscera shows the uterus enlarged in early pregnancy, and vascular engorgement of the breasts. That it was made between 1500 and 1506 is suggested by the many anatomical errors, corrected by Leonardo in subsequent years.

FIG. 3. Female pregnant figure (Quaderni 3.1.v.). Amongst these drawings of male and female genitalia are two of the uterus. In the middle above is the nonpregnant uterus with its internal cavity outlined. Below and to the right, the 4-5-month pregnant uterus is seen, rising behind the full-rounded bladder. The lordosis (anterior curve) of the spine with protuberant abdominal wall is most realistic.

FIG. 4. The foetus in the uterus (Quaderni 3.8.r.). These drawings are designed to show the foetus in the uterus and the surrounding membranes. Sketches below and to the right of the main drawing show these layers peeled off. In one the foetus is seen through the transparent amnion.

FIG. 5. Leonardo's study of the stratification of rocks. (Reproduced from *The Drawings of Leonardo da Vinci*, A. E. Popham, Ed., 1945.)

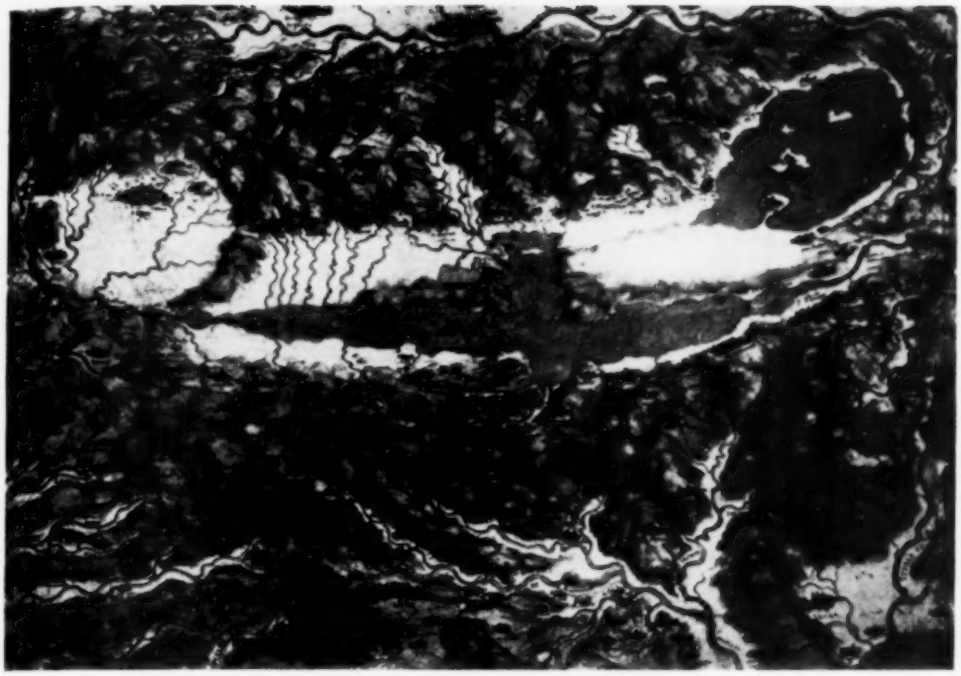

FIG. 6. A map of part of Tuscany: Arezzo to Perugia. A drawing of a region described by Leonardo as an ancient sea or lake, which in the past filled the valley from "Arezo" on the left (the name can be read with a magnifying glass near the top of the light circle at the left) to the lake of Perugia on the right. The river Arno winds off the left edge of the map. This same region is included in the map of the Arno watershed (Fig. 7). (Reproduced from *The Drawings of Leonardo da Vinci*, A. E. Popham, Ed., 1945.)

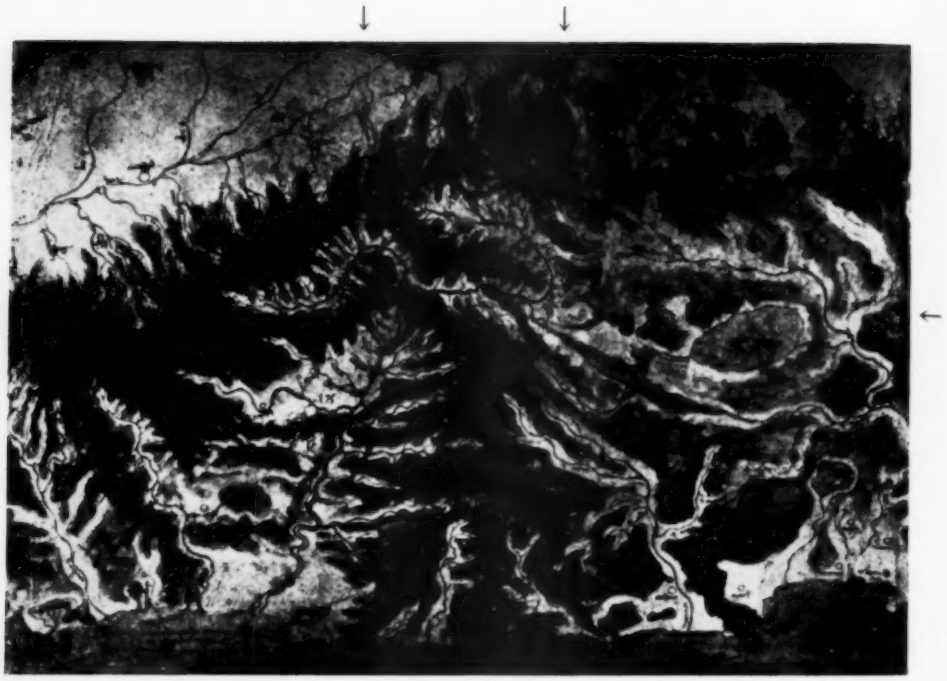

FIG. 7. A map of the Arno watershed. This illustrates three seas of the past described by Leonardo. The white valley areas amongst the dark mountains represent lakes or seas at various altitudes; the higher seas having emptied by narrow gorges into lower seas. The river Arno can be seen passing through these seas of the past down to the Mediterranean Sea of the present. Arezzo is located approximately at the bisection of lines drawn from the two arrows at the right, Florence, from the two arrows at the left. (Reproduced from *The Drawings of Leonardo da Vinci*, A. E. Popham, Ed., 1945.)

FIG. 8. Detail of the two lakes or seas to the right of the Mona Lisa's head. Note the narrow gorge joining the two seas.

The Louvre, Paris

FIG. 9. The Saint Anne, Madonna, and Child. In this picture of three generations Leonardo depicts seas in the background at three levels.

Valleys were formerly in great part covered by lakes because their soil always forms a bank for rivers, and by seas which afterwards through the unceasing action of the rivers that form the store of water that is in the m[ountains], cut through the mountains. . . .

To the north stands the Carpathian range which encloses the breadth of the Valley of the Danube. . . . Through the midst of it flows the Danube, the first river of Europe in magnitude, and this Danube as it flows leaves on the south, Austria and Albania and on the north Bavaria, Poland, Hungary, Wallachia and Bosnia. The Danube . . . then flows into the Black Sea which used to extend almost as far as Austria and covered all the plain where to-day the Danube flows; and the sign of this is shown by the oysters and cockleshells and scollops and bones of great fishes which are still found in many places on the high slopes of the said mountains; and this sea was created by the filling up of the spurs of the Adula range [Balkan and Rhodope mountains] which extend to the east and unite with the spurs of the Taurus range extending to the west. And near Bithynia the waters of this Black Sea discharged themselves into the Propontis [Sea of Marmora], falling into the Aegean Sea, that is the Mediterranean Sea, where at the end of their long course the spurs of the Adula range are severed from those of the Taurus range; and the Black Sea sank down and laid bare the valley of the Danube with the above-named provinces, and the whole of Asia Minor beyond the Taurus range to the north, and the plain which stretches from the Caucasus to the Black Sea to the west, and the plain of Tanais (the Don) this side of the Ural mountains that is at their feet.

So the Black Sea must have sunk about a thousand braccia [1,500 feet] to uncover such vast plains. (Leic. 1.v)[33]

Just as the waters of the Black Sea broke through and flowed into the Aegean, so did those of the Persian Gulf: "The Persian Gulf which was once a vast lake of the Tigris and had its outlet into the Indian Ocean, has now worn away the mountain which served it as a bank, and become the same level as the Indian Ocean. . . . (Leic. 31r)"[34]

Here Leonardo is illustrating the natural law that water descends, and lakes and seas formed in this descent break their barriers to flow to lower seas, always flowing towards the lowest sea of all which is the Ocean—Atlantic or Indian. Thus primeval seas are formed in tiers and as time passes they break their barriers flowing to lower seas, the soil deposited on their beds emerging as dry land in the form of valleys and plains behind them. This is Leonardo's conception of the way the earth gradually arises out of the water.

Applying this conception to the Mediterranean he finds it to be "the greatest river in the world . . . that moves from the source of the Nile to the Western Ocean," through the Straits of Gibraltar. "Before this cutting in the mountains of Cadiz [the Straits of Gibraltar] was formed the surface of the Mediterranean Sea

[33] *Ibid.*, vol. I, p. 348.
[34] *Ibid.*, vol. I, p. 363.

was very high, and surpassed the height of three parts of the Alps, and the penetration of the sea through the passages and veins of the earth was very high and abundant; and after this cutting of Cadiz the surface of the Mediterranean Sea there was lowered . . . and the rivers lost the abundance of their streams. (BM.168v)"[35]

Fossils again provide his evidence for this: "And we find the oysters together in very large families, among which some may be seen with their shells still joined together, which serves to indicate that they were left here by the sea and that they were still living when the straits of Gibraltar were cut through. . . . (Leic. 9v)"[36] Before the Straits of Gibraltar were eroded into being, this large primeval Mediterranean Sea was so high and deep that "the peaks of the Apennines stood up in this sea in the form of islands surrounded by salt water. Nor did Africa as yet behind its Atlas mountains reveal the earth of its great plains naked to the sky . . . and on the shore of this sea stood Memphis; and above the plains of Italy where flocks of birds are flying to-day fishes were once moving in large shoals. (Leic. 10v)"[37]

The primeval sea nearest to Leonardo, involving indeed both Florence and his native Monte Albano, was the subject of intense study during his time as military engineer to Cesare Borgia, during the very years he was occupied with the portrait of Mona Lisa. These seas are drawn in his magnificent maps of Tuscany, and described in a note, which is again concerned with fossils:

> . . . the great valley of the Arno above Gonfolina, a rock which was once united with Monte Albano in the form of a very high bank. This kept the river dammed up in such a way that before it could empty itself into the sea which was at the foot of this rock it formed two large lakes, the first of which is where we now see the city of Florence flourish together with Prato and Pistoia; and Monte Albano followed the rest of the bank down to where now stands Serravalle. In the upper part of the Val d'Arno as far as Arezzo a second lake was formed and this emptied its waters into the above-mentioned lake. It was shut in at about where we now see Girone, and it filled all the valley above for a distance of forty miles. . . . This lake was joined to that of Perugia. . . . (Leic. 9r)[38]

This brief survey of Leonardo's geological concept of the formation of the earth reveals two main points relevant to his picture of Mona Lisa:

1. The reality for Leonardo of the analogy between the body of man and that of the earth—an analogy he applied to all bodily functions except movement. The link forging this analogy is water, "the vital humour of this arid earth," which by its move-

35 *Ibid.*, vol. I, p. 388.
36 *Ibid.*, vol. I, p. 355.
37 *Ibid.*, vol. I, p. 359.
38 *Ibid.*, vol. I, p. 352.

ment nourishes the earth in the same way as the blood nourishes the body of man. Leonardo conceives the foetus to be enclosed in its amniotic waters in the uterus in the same way as the earth was at first enclosed in its watery envelope. For him the creation of both meant emergence from these primeval waters.

2. His depiction of mountains and lakes in the background of Mona Lisa's portrait represents his description of the fall of one sea into another below, a process which Leonardo describes for the Black Sea, the Persian Gulf, and the Mediterranean, in all of which instances the higher sea is described as falling into the lower through a gap or strait. At the time of painting the Mona Lisa he was making maps of the nearest example of such past seas, in the valley of the Arno. This sea involved his home city, Florence, its shore formed by Monte Albano, the mountain he wandered on as a child in Vinci. Thus the primeval mountains and seas behind the Mona Lisa's head are associated not only with his general picture of the formation of the earth, but with the formation of the valley of the Arno, the country of his birthplace, of all places the one most likely to have been uppermost in his mind at the time he was making the portrait. This is not to suggest that the mountains and lakes in the picture are necessarily realistic representations of the mountains of Tuscany. They are essentially imaginative, since they form his conception of the aspect of the earth's long distant past; they are Leonardo's illustration of its creation or genesis.

Examination of the seas and mountains behind Mona Lisa shows primeval seas at two levels; the upper on the right is separated by a "very high bank" from the lower. Down the bank flows a tortuous stream indicating that the barrier is breaking, the outflow has begun which will lower the surface of the upper sea, eventually to form a dry valley, drained by a river which will continue to fill the lower sea, already bordered by loose soil containing some vegetation—the "flesh and hair of the earth." This world flesh stretches up to the villa, on the loggia of which Mona Lisa sits. Similarly within the body of Mona Lisa there are two lakes, the "pool of blood" in her heart, which empties its blood through the tortuous stream of an umbilical cord to another lower lake, the foetus within its amniotic fluid in her womb, the weight of which is spread over the bones of her pelvis, like the weight of a sea on its bed and shores. Leonardo, to whom the creation of man and the world was so significant an object of investigation,

circumscribes the formation of man by the formation of the world—in short in this picture he tells the full story of Genesis.

It might be said that this association of mountains and lakes with the Mona Lisa is fortuitous; that to read so much into it as has been suggested is attaching too much importance to a chance association. This indeed might reasonably be claimed if the association were isolated. But it is not, for it occurs in two other pictures with motherhood as their central theme, in the Madonna of the Rocks, and in St. Anne, the Virgin and Child.

The Madonna of the Rocks is notable for the deep immersion of the central figures within a cavern of the earth. This holy group, in the light of Leonardo's geological views, may be seen to be within one of these deeper caverns, with which the earth is filled. Around and behind he places his symbols of the creative earth's heart, bones, and flesh in the shape of a lake, or sea, mountains and the soil and flowers within the cave. He even conveys the impression of past ages by including fossils, whose significance of past life he divined. For Leonardo, God-the-Mother is enclosed within the body of the earth, where the Son and Holy Ghost abide also. The Earth has its holy spirit as well as its child, Man.

Again with the Saint Anne, Virgin and Child, the well-known mountains and seas rise high into the background, some say, as with the Mona Lisa, too high for purely artistic purposes. Leonardo is here portraying creation in three generations, the child, the child's mother, and grandmother. In this instance primeval seas mount up in *three* tiers, each linked by small waterfalls. Again one is confronted with the choice of attributing this to chance, decorative enthusiasm, or intellectual symbolism, founded on Leonardo's known geological views. It seems only reasonable to accept the last unless some alternative, more in keeping with Leonardo's outlook, can be put forward.

Study of his anatomical drawings in detail invariably leads one to realise that the intellectual content of even the most cursory sketch is far greater than one at first believes. By how much more must this apply to his elaborately devised backgrounds in these three pictures. Surely in them all Leonardo is expressing as clearly as he could, or dared, that pantheistic belief in Mother Earth which permeates all his writings, God often being given the pseudonyms "Nature" or "Necessity."

Thus the portrait of Mona Lisa contains strong direct evidence of her pregnancy, with which her personal story is con-

sistent; and the background of the portrait adds Leonardo's symbolic representation of the process of Creation of the world; their harmonious union can leave little doubt that Leonardo's picture hitherto known as the Mona Lisa would be more significantly called Genesis.

Other Interpretations

It is natural to turn to the many previous interpretations of Mona Lisa for confirmation or refutation of the view expressed above. Two surprising results emerge from such an inquiry—first that pregnancy does not appear to have been suggested as an answer to the Mona Lisa's "secret"; secondly, that tacit evidence of support for such a suggestion is contained in many of the comments. For example, descriptions of the Mona Lisa almost constantly describe her emotional state by such adjectives as "quiescent," "placid," "tranquil"—all states of mind characteristic of healthy pregnancy, but not typical of feminine allure.

Vasari is immersed in the realistic nature of the modelling and colouring; his emphasis lies heavily on "all the details painted with great subtlety," of these details he particularly noticed the moisture of the eyes and "livid reds" about them— "the delicate reddish apertures of the nose." "The opening of the mouth with its red ends" and "the scarlet cheeks seem not colour but living flesh." Whatever else may be conjecture, one can at least be sure that the Mona Lisa was not anaemic! Some of these features are still faintly visible if the picture is carefully examined, particularly the highly coloured cheeks. "To look closely at her throat," writes Vasari, "you might imagine that the pulse was beating. . . ." This is a feature which, combined with her high colour, might suggest the hypervolaemia or plethora which commonly underlies the bloom of pregnancy. It may be that in the fullness of the throat Vasari refers to the enlarged thyroid.

Muntz,[39] in describing the face, comments on the fullness of her cheeks: "L'héroine de Léonard les joues pleines, presque bouffies, les yeux plissés"—almost puffy with puckered eyes. He also remarks on the curious fact that such a lady of fashion is not wearing jewels for her portrait.

Sirén notes[40] that in portraiture Leonardo's insight into human character tends to generalisation of a type which is "always based

[39] Müntz, E. *Op. cit.*
[40] Sirén, O. *Leonardo da Vinci, the artist and the man.* New Haven, 1916, pp. 150-161.

on nature, never the translation of merely external phenomena." He points out that Leonardo's interest in women was centred on their "spirituality, intelligence and beauty," and that the Mona Lisa is "a monument to feminine character." It is curious that of all the aspects of women which were interesting to Leonardo, Sirén omits to mention that of motherhood; "the monument to feminity," he so rightly describes, cannot be more suitably translated than as an illustration of pregnancy.

The smile, Sirén feels, is not of joy, charm, or love, "but rather the mantling disguise for a deeper-lying feeling which must not be betrayed. The solution is only to be found through most thorough study of the artist's own life. The enigma which dwelt in the depths of Leonardo's own soul is also to be found in his works, and particularly in this portrait." This verdict requires the study of Leonardo both as man, artist, and scientist, before valid interpretation is possible. In the last 40 years, the increased knowledge of his scientific and emotional life enables one to reach much nearer the solution.

Interpretations so far quoted have been male assessments. It is of interest to compare these with two feminine points of view. Rachel Annand Taylor[41] denies the possibility of Leonardo being in love with the Mona Lisa: "It is hard to understand the sentimentalists who imagine that this was the mistress of Leonardo's love." Having satisfied herself on this score she finds herself left with only one possible attraction—and that equally sentimental, cruelty. "He painted the Mona Lisa with the comprehension, not of love, but of secret cruelty." Pregnancy and motherhood curiously do not occur to her as attractions for Leonardo. Yet she verges on this solution: "Women regard her a little uneasily, for they are dimly aware of her simple riddle—that she is enchanting but disenchanted, with the disenchantment of every woman who has found love's consummation destroy the rare pattern of her illusion." With this verdict the hypothesis of pregnancy is entirely in agreement—the words might be chosen to support it.

Antonina Vallentin,[42] a mother, dwells on the difference between the Mona Lisa and contemporary Florentine standards of feminine beauty. She contrasts the "slender women with girlish faces poised on long slim necks, fragile figures with sloping shoulders," with the Mona Lisa—a "robust well developed woman;

[41] Taylor, R. A. *Leonardo the Florentine, a study in personality.* London, 1927, pp. 352-358.
[42] Vallentin, A. *Op. cit.*

marriage and motherhood had filled out her figure and her face had broadened"—but does not attribute this difference to pregnancy. "Her face was a commonplace one, the product of a commonplace existence—a face that revealed perfect health and imperturbable calm, the face of a woman whose senses had been dulled by the lazy flow of her existence, and who whiled away her days with little to expect or desire." One cannot help regretting that Vallentin did not aptly crown this description with the words, "the face of a pregnant woman."

In the description of Mona Lisa's figure, Vallentin draws attention to "her dress drawn tightly over the full breast," and "the pearly surface of the full and firm neck"—the import of which as signs of pregnancy elude her.

The significance of the Mona Lisa's expression she finds in Leonardo's own saying: "If the soul finds a being that resembles the body which it has built for itself it finds that figure so pleasing that it falls in love with it." If we accept the Freudian possibility that Mona Lisa was like the mother with whom Leonardo fell in love as a child, then this interpretation of his attitude becomes true—the portrait *was* "an essay in the representation of woman," the most essential of all women, his own mother, in the act of creating himself.

Heydenreich[43] at once admits that the comprehension of the Mona Lisa holds the key to a comprehension of Leonardo: "The Mona Lisa has come to represent Leonardo's mind and work for all subsequent generations for in it his outlook is seen with the greatest clarity and completeness." Such a view means that we must look into the scientific content of Leonardo's mind as well as his artistic motives for solution, for if ever a man sublimated his sexual emotions into intellectual passion it was Leonardo, seeking out the natural laws of the macrocosm and microcosm, of the world and man.

Heydenreich, like others, senses that Leonardo was portraying a natural symbol or law in the portrait, and considers any personal relationship between painter and model unlikely. "This however deserves reflection; not only does it seem unlikely in the light of what we know about Leonardo's personality, but because the painting itself is impersonal in the fundamental and most complete meaning of the word." Impersonal in that it represents a

[43] Heydenreich, L. H. *Op. cit.*

symbol of the essence of woman, yes, but not in the sense that Leonardo himself was personally unmoved by it; on the contrary, evidence has been given that his attachment to it was intense, perhaps the closest attachment he allowed himself after he left his mother.

In describing the crossed hands, Heydenreich notes that "Leonardo invented this form of lightly crossed hands which in its simplicity and naturalness imparts great security as well as sense of completeness to the portrait." This posture is surely new because it solves a new problem. Few previous portraits of pregnancy had been made. Even today women do not usually choose that period of their lives for their portraits. The difficult aesthetic problem of harmonising the disproportions of pregnancy, and presenting it as the beautiful process he saw it to be, was solved by Leonardo in the simple half-turn of Mona Lisa's body, the arm being brought across the big belly and the hands lightly crossed on the arm of her chair. Both in its effect of beauty and in its camouflage this posture has been eminently successful.

With regard to her smile, Heydenreich calls it "the key to the mystery of the Mona Lisa," but continues, "its meaning is of far less importance than the mere fact of its existence; in its essence it is nothing more than the very first stage of transition from an expressionless quiescence to first expression." This is a picture of the beginnings of things, of creation, and here Leonardo has portrayed the genesis of a smile, which starting in the eyes, has as yet only just touched the lips. It is the smile that arises from the vegetative "expressionless quiescence" of a woman in pregnancy.

Heydenreich like so many feels the necessity of quoting Pater's famous lines[44] in describing the Mona Lisa—and Pater chose his words with a poet's insight. Poetic truth always reaches out towards what is at the time intellectually unattainable. For this reason as time passes poet's truth often becomes overlaid by scientific hypothesis. In describing the flesh of Mona Lisa, Pater remarks that, "The flesh is laid on cell by cell," his words illuminating its construction by both the artist and nature. Heydenreich takes up the artistic aspect, remarking, "no other picture in truth presents such an infinite number of glazes." But there is biological truth in it too; for the hormonal tides of pregnancy also build up the tissues of the mother, moistly, cell by cell—and the artist's glazes are but simulations of the cellular ripenings.

[44] Pater, W. The renaissance; studies in art and poetry. London, 1894, p. 128 ff.

In relation to the expression on Mona Lisa's face, Sir Kenneth Clark's remarks[45] are of particular interest. He finds in it "something worldly, watchful, and self-satisfied," commenting that the features are not Leonardo's "ideal of beauty." The three adjectives again might be specially chosen to describe a pregnant woman, for this state is known to impart a worldly watchfulness and self-satisfaction; and few men find in it their ideal of feminine beauty. In Clark's opinion, Leonardo "sees her physical beauty as something mysterious, even a shade repulsive." This verdict is confirmed by Leonardo's own statement, "concerning woman in whom there is great mystery on account of her uterus and its foetus." It is the foetus within her that Leonardo himself feels lends the mystery to woman. Clark, however, suggests that this feeling is "as a child might feel the physical attraction of his mother." Whether influenced by Freud or not in this opinion he here recognises the mother-figure theme of the picture, but not to the point of seeing it as literally true.

Clark also draws attention to the resemblance of Leonardo's mountainous background to the craggy precipices found in Chinese painting, thus reviving the suggestion of a possible Chinese influence on Leonardo. Sirén found this unacceptable, but the resemblance, as in certain similar problems of evolution, may well be accounted for by principles of convergence rather than common ancestry. The similarity may indeed, as Clark feels, be more than accidental, for both Chinese artist and Leonardo were imbued with the macrocosm-microcosm analogy, and both used the mountain landscape as symbols. For the Chinese the trigram Ken indicates "mountains, what sustains, solidity, gravity, quiet"; for Leonardo mountains are "the bones of the earth." It is not therefore surprising that these two schools of thought should reach a common style in their representation of such symbolic masses.

Clark, appreciating Leonardo's conception of rocks and mountains as the basis of the earth, does not carry this further, into Leonardo's recognition of lakes, river, and seas, as the earth's heart and blood vessels, and the soil as earthly flesh. He thus fails to reach that conception of the physiology of the earth so real to Leonardo, and so vital to the comprehension of Mona Lisa as a symbol of Genesis.

[45] Clark, K. *Op. cit.*, pp. 117-122.

Freud's views like Pater's penetrate with poetic insight into the relation between Leonardo and Mona Lisa. Freud was a poet of the mind, and like all great and prolific poets he mixed his gold with a considerable amount of dross. Both are to be found in his study of Leonardo.

Describing Mona Lisa's smile Freud writes: "Her smile fascinated the artist no less than all the spectators for these 400 years. He found this smile in his model and became so charmed by it that from now on he endowed it on all the free creatures of his phantasy."[46]

Freud's thesis of Leonardo's mother-fixation interprets the smile as the link between Leonardo and his love object, his mother. He sees in this smile the reason for Leonardo choosing Mona Lisa as his model when many richer and more famous women were clamouring to sit for him. He sees it too reflected in the St. Anne. Freud claims that it was from this reflection of his mother's smile that Leonardo obtained release from that inhibition of artistic expression which persistently dogged him; by it he was freed to make his last successful artistic creations in a wave of relatively uninhibited painting. Freud's interpretation may be further amplified, if it is recognised that Leonardo chose the Mona Lisa not only for her maternal smile but because he found in her the essence of motherhood, pregnancy.

Pater and Freud are at one in the passage in which Pater writes: "Besides the picture is a portrait. From childhood we see this image deepening itself on the fabric of his dream, and but for express historical testimony we might fancy that this was but his ideal lady, embodied and beheld at last."[47] Freud quickly comments that this is not to be taken merely as poetic fancy, but literally; that this "ideal lady" is indeed the embodiment for Leonardo of his mother-image. Freud insists on taking Pater's words literally, and there is now sufficient evidence for amplifying this conclusion and insisting that the Mona Lisa is in fact Leonardo's embodiment of his mother image, not only by virtue of a remembered smile but also as a pregnant woman.

Pater gives us another key to our problem when he describes Leonardo's types of womanly beauty as "clairvoyants, through whom, as through delicate instruments one becomes aware of the

[46] Freud, S. *Op. cit.*, p. 83.
[47] Pater, W., *Op. cit.*, p. 129.

subtler forces of nature and the modes of their action—of all those finer conditions wherein material things rise to the subtlety of operation which constitutes them spiritual—it is as if in certain revealing instances we actually saw them at their work on human flesh." "A feeling for maternity" he adds, "is indeed always characteristic of Leonardo."[48]

And nowhere do we see more clearly Leonardo revealing the subtle forces of nature at work on human flesh than in this pregnant figure of Mona Lisa. Here Leonardo created his ideal picture of motherhood, and painted into it the symbols of the genesis of Man and his Mother, Earth.

[48] *Ibid.*, p. 118.

Weights and Scales in Mediaeval Scandinavia

A New Proof of Arabic Influence on Northern Europe in Viking Times

BRUNO KISCH*

A RECENT visit to the Scandinavian countries for the purpose of comparative and historical investigations on weights and balances led to some observations which seem worth while to report.

In the collections of the Royal Mint Cabinet of the National Museum in Stockholm, among the contents of a Viking grave, there are a balance and some weights belonging to it. This small brass balance is of the collapsible type with two joints in the beam, well known from Roman and Byzantine times, and found not infrequently among Egyptian excavations. This type always suggests its use in travelling, or at least outside the owner's own home. The beam of the present balance has a broad triangular indicator reminiscent of a willow leaf. The early Roman balances had no indicator at all. The pivoting point and axis of the entire balance in the Viking example are not, as in later centuries, in the middle of the beam, but are located in the lower part of the beam's indicator. The axis is part of the gallows (or shears) in which the indicator is supposed to stay centered if the balance is in equilibrium (Fig. 1). This little peculiarity is also typical of balances from Byzantine times and is later found frequently among early mediaeval antiquities from Egypt. Not only is the likeness between the scales from the Viking grave and similar objects from Roman and Egyptian excavations noted, but this similarity extends even to small details like ornaments of the type of a bird's eye (⊙) which are known from early Egyptian times and are common in Roman, Byzantine and early Islamic eras. This motif can frequently be found in the Middle Ages as an ornament on weights and scales and, at least in European cultures, it came originally from Egypt where it may be found on objects of the late new kingdom (*c.*14th century B.C.)

Exactly the same type of scales and weights, all of them coming from graves of Viking times, are to be found in the museums of

* Curator, Edward C. Streeter Collection of Weights and Measures, Yale Medical Library, Yale University School of Medicine.

Copenhagen and of the University of Uppsala. In some of the tombs not only the typical folding scales already mentioned were found, but also handy little brass boxes containing such scales. Their form is that of a low cylinder, the top and bottom of which are in the shape of a calotte. The cylinders consist of two congruent halves which fit together. These very practical receptacles for portable scales and weights represent some of the oldest types of "scale and weight boxes" as used so commonly later on by merchants all over Europe up to the early nineteenth century. In more recent times they are mainly represented by the so-called "gold scales" (Goldwaage or Trebuchet) consisting of a box made of metal or wood which contained a collapsible or non-collapsible scale and different weights. They were used principally for checking the weight of current gold coins or of valuable metals (gold, silver) or of precious stones. The oldest such boxes of wood are also known from Byzantine times and especially from Egyptian excavations, dating from the Middle Ages.

Not less interesting than the scales and scale and weight boxes found in Viking graves are the weights themselves. In the museums of Stockholm, Uppsala, and Copenhagen two distinct types of these weights can be found. One type corresponds closely to the Roman bronze weights of the fourth to the sixth century as they were used later on for centuries in Arab countries either in their original form or with typical variations. One of them from the Near East in this writer's possession still bears marks from the eleventh century. Their form is either that of a segmented sphere or of a truncated double cone, the top and bottom plane showing in the center a little groove or navel caused by the mechanical instrument (lathe) used to shape the object. The center is often surrounded by one or more ornamental circles. This is exactly the form of most of the weights found in Viking graves. We shall call it type A. But there is one difference from Byzantine or Islamic imported weights. In Roman times the material for these weights was originally stone (limestone, marble, basalt, serpentine, etc.) and remained stone up to the early fourth century. Later on in Rome and in Byzantium and still later in the Islamic countries for many centuries the weights were made of brass. This was so constantly the case that Professor Pink, probably the most outstanding connoisseur of antique Roman weights, regards every statement in the literature that metallic Roman weights had been made of iron as erroneous. Among the Viking

weights of the segmented sphere type, however, many are made of iron covered with brass. To this fact we shall return later on.

There is another common type of weight found in Viking times, which we shall call B. It was most surprising to this writer to find this second type because it is used exclusively for Islamic weights from mediaeval times up to the nineteenth century. This form B shown in our Figures 2 and 5 can best be described as a polyhedron produced by cutting every single corner of a cube in a triangular shape. This results in a form which may be called cubo-octaëdric and is aesthetically a very attractive pattern. The crystallographers call this form an equilibrium of cube and octaëder (see picture).

Such weights have been found in the famous commercial center of Birka (Sweden) which flourished during the ninth and early tenth centuries and then disappeared as a place of any importance; and we find exactly the same form of weights in Denmark from the time of the Vikings.

Similar discoveries were made in Haithabu, a famous place of commerce in the ninth and early tenth centuries in Schleswig (North Germany). In his excellent monograph on Haithabu, Jankuhn has pictures of only three weights of type A, one of the Byzantine design of a round disc, and two square plates reminiscent of certain Greek types of weights. In Haithabu a weight of the cubo-octaëdric type was also found, as Professor Jankuhn was kind enough to inform this writer.

Another small detail may support our theory that the cubo-octaëdric form of weights and probably also the type and appearance of the scales in Viking times were strongly influenced by the Islamic world. The pans of the scale found in Birka (Arbman,[1] table 26) are attached to the beam with four strings each and the same is the case in the Nordic balance depicted by Arne (Fig. 329a.1).[2] We know from relics found in Pompeii (the mural representing the workshop of a goldsmith and the specimens of Roman scales) that in early Roman times both kinds of attachment of the pans to the beam were used, one with three and one with four strings or chains. The three-string connection was preferred in central Europe except for heavy scales used in commerce where a four-chain attachment of the pans was often used later on also. In the Orient, however, for reasons not well understood, the four-string attachments of olden times have remained popular up to our day. Perhaps the Islamic people avoided the three-

string attachment as a potential symbol of the Christian trinity. Whatever the reason may have been, the fact is that scales with the three-string attachment of the pans were rare in the Near East. This again is a hint that scales and weights found in Viking graves in Scandinavia may have been imported from the Orient or may have been fashioned under the influence of models imported from the Orient (see Fig. 9).

Archeologists have apparently not yet given the attention they deserve to the form and material of weights and scales in spite of their importance in questions of early international relationships.

Discussion

The discovery of certain types of scales and weights in Scandinavian graves from the eighth to the tenth centuries justifies the conclusion that marks of Islamic culture had already reached the Nordic European countries in early mediaeval times. This statement agrees with the well-known historical facts about certain links between the Vikings and the Islamic countries. Direct contact was made by Viking soldiers with Arabs in the Orient as well as in Spain.[4,5,6,10,11] It is also well known that Prague in Bohemia was in these centuries a center linking the North and the East in commerce,[4] and so also may Haithabu have been. Quantities of coins found in Gotland as well as in Denmark contained mainly Arabic examples. Some of those found in Gotland, enumerated in the excellent work of Stenberger, contain exclusively or mainly Arabic coins. In Ostris, for instance, a treasure probably hidden in 875 contains no less than 456 coins, all of them Arabic.[11] Studying such findings, one gets the impression that coins from other countries like Germany, England, and from Scandinavia itself have played a role of no great importance compared with the Arabic coinage among these discoveries. This may lead to the conclusion that in Viking times Arabic coinage was in general use in Scandinavia; maybe in some places it was practically the only currency used.

It is quite possible that these coins had been acquired by pirates of the North looting Spain or other Islamic countries. The loot may then have been buried either for later reference or (as suggested in literature) as a kind of religious offering; and if the individual or tribe which buried it did not return from the next expedition, such treasures remained buried for more than a thousand years.

Weights and scales of Islamic type must have been objects commonly used in daily life. Arne[2] mentioned as early as 1914 34 such balances. The fact that they were buried with household instruments which accompanied the dead to their graves speaks for a peaceful commercial intercourse, direct or indirect, between the Vikings and some Islamic people. This fact hints at the existence of commercial as well as belligerent relations between these two ethnic groups, which Arne,[2] Jankuhn,[4] and others have also emphasized.

Among these discoveries, those from Birka can be attributed to a certain period—between the early ninth and mid-tenth centuries. From this time stem also Arabic coins found in pocket purses among the contents of Viking graves. That, too, confirms that the Viking period was the time not only of the great pirates and warriors of their age but also of great merchants who took from the Islamic people the essence and form of their most important commercial tools: coins, scales, and weights.

Our observation also permits certain conclusions useful in the study of the history of bronze weights in Islamic countries. The Arabic weights in the form of the square-triangle polyhedron (cubo-octaëdric form) must have been in use by the end of the eighth century or earlier.

A last question of archaeological interest is: Where were those weights and scales from Viking graves fabricated? The Oriental ornaments and forms suggest importation from the Islamic countries, and this seems to be true at least for the first such objects which came to Scandinavia. However, in all these countries the weights were made of brass, and of those found in Scandinavia many are made of iron with a brass cover—a combination not known in Rome nor in Byzantium or the Islamic countries. In the Edward Clark Streeter Collection at Yale University there is a single eight-ounce weight, apparently of Egyptian origin, of the segmented-sphere form which is definitely made of iron. This may be a link between the Islamic and the Scandinavian weights. Brass weights with an iron nucleus are known from mediaeval Scandinavia only, and that seems to prove that this kind of weight was a product of Scandinavian home industries and not imported, as at least some of the solid brass weights may have been. Probably the production of weights of iron with a brass cover was more economical in Scandinavian countries at this time. It seems very doubtful whether spheres

FIG. 1. Roman collapsible scale exactly like those found in the graves of Viking times. (Courtesy of the Römisch-Germanisches Zentral - Museum, Mainz, Germany.)

FIG. 2. Weights (enlarged twice) from a Viking grave, Valsgärde, Ksp. Gamla Uppsala, Uppland. At the top, two weights of the oriental cubo-octaëdric type; at the bottom, one of the segmented-sphere type. (Courtesy of the University of Uppsala Museum of Nordic Antiquities. Photo by Allan Fridell.)

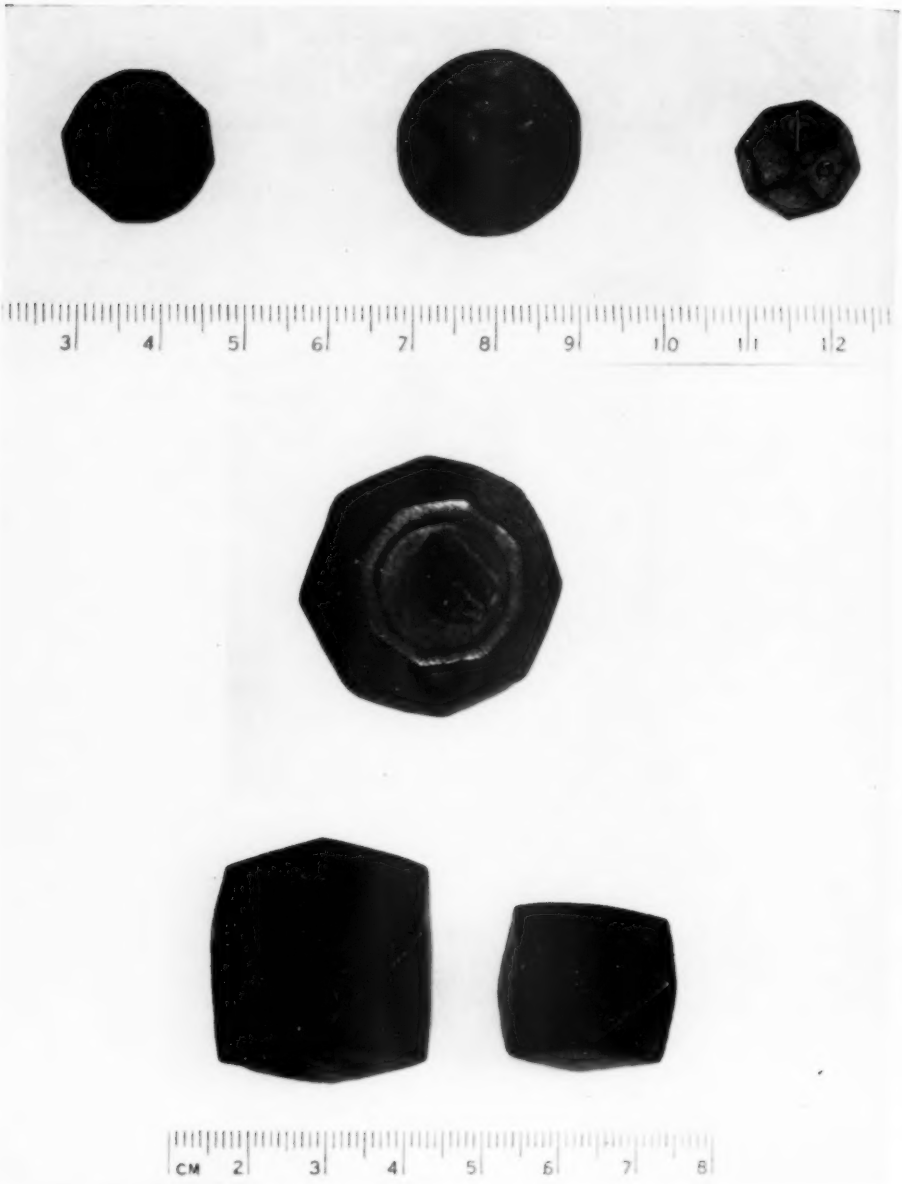

FIG. 3. Three Arabic weights of the pentagonal-facet type, eleventh to the fifteenth centuries. (Collection of the author.)

FIG. 4. One of the three weights of Figure 3 (enlarged) dating from the eleventh century, with legible inscription.

FIG. 5. Modern Turkish cubo-octaëdric weights from Istanbul (eighteenth century). This type of weight has been used from the ninth to the nineteenth century. (Collection of the author.)

FIG. 6. Weights from Viking times at the Uppsala University Museum of Nordic Antiquities. All of the segmented-sphere type, three with late Byzantine ornamentation. Of the greatest interest is No. 3442, the ornamentation of which is an imitation of an Arabic inscription as found on Arabic silver coins. (Courtesy of the Museum. Photo by Allan Fridell, enlarged twice.)

FIG. 7. Swedish mediaeval weight in the form of a horse with a hallmark on its body. (Courtesy of the Stockholm National Museum. Photo by Ata.)

FIG. 8. Three animals from ancient Persia, the left one and the middle one Luristan about 1500 B.C. The right one Southern Persia (Achemon about 500 B.C.). The middle one silver, the other two bronze. (Collection of the author.)

FIG. 9. Bronze scales from Viking times from boat-grave No. 12 Valsgärde, Gamla Uppsala, Uppland. (Courtesy of the University of Uppsala Museum of Nordic Antiquities; Inv. no. 5912. Photo by Allan Fridell.)

with the central point of a lathe as used in late Roman, Byzantine, and Islamic times were made in Scandinavian countries where such instruments at that time seem not to be known. They are probably imported weights. This point, however, needs further clarification.

Of special interest in this regard is the weight in our Figure 6, signed 3442. On the surface of the weight are ornaments closely resembling the Arabic inscriptions on mediaeval Arabic silver coins. Actually it is not an Arabic inscription and the signs have no meaning at all (this was confirmed by the expert opinion kindly given by Mr. George C. Miles of New York), but they are a kind of imitation of Kufic Arabic script. What this "arabesque" ornamentation suggests is that the maker or finisher of the weight, whoever he was—goldsmith or a craftsman specializing in making brass weights—was so impressed by the appearance of Arabic writing on the Arabic coins that he tried to imitate it to embellish the product of his art. Here again is proof that Islamic art influenced the Scandinavian artist in Viking times. The ornaments on the other weights in this picture may have been affected by Byzantine or other early Christian emblems.

One more remarkable result of the importation of Islamic weights can be noticed among the discoveries in Gotland.[11] One bracelet in the form of an open clasp was found where each end of this open ring is adorned with a polyhedron exactly of the cubo-octaëdric appearance of the Islamic weights. Many similar bracelets were found in Birka (tables 53-56 in Arbman's book).[1] Of course the silversmith and the goldsmith were continuously working with weights and scales, and the interesting and appealing forms of Islamic weights inspired the creative phantasy of the artist to new and fashionable designs. In Islamic countries, too, this type of polyhedron was of course also used as an ornament. Similar Arabic bracelets are depicted in Arne's book.[2] On the branches of a little folding scale of the late Roman or Byzantine period, originally from the collection of Sir Frederic Cook and now in the Streeter Collection, the cubo-octaëdric bodies are used as ornaments too. The same is true of the scale (Fig. 1) from the Römisch-Germanische Museum in Mainz.

In Islamic countries another typical form of weight very common in mediaeval ages was a round body, segmented on top and bottom which had pentagonal and sometimes also hexagonal facets all over its surface. It comes very near the crystallographic form

of a Pentacododecaeder (see Figs. 3 and 4). Usually the plane of each facet of these weights is adorned with a bird's eye (⊙ or two circles enclosing dot). This form has not yet been found among the Viking objects. One may thus conclude that it became popular in Islamic countries only after the ninth century. This is of some interest in the archeology of Arabic weights because only very few among the known Islamic bronze weights have clearly legible marks. Probably the oldest among them is in the possession of this writer, bought by him in Jerusalem. It bears the inscription AL IMAM MA'DD, AL MUSTANSIR BI'LLAR (see Fig. 4; also Fig. 3, left). I owe the deciphering of this legible inscription also to Mr. Miles who is a world-renowned expert in this field. The inscription indicates the mark of a Fatimid Calif of Egypt who was in power from 1036 to 1094 (Islamic 427-487). If the pentagonal form of weights was introduced at that time or shortly before, then we can understand why it did not appear in the North of Europe in Viking times.

In Scandinavia in the late Middle Ages, however, there appeared another interesting type of weight in the form of little animals, horses, cows, and some forms like a tiger (not a lion); part of them bear marks which may be royal hallmarks (see Fig. 7). Today there is a certain amount of literature about these mediaeval weights from Denmark and Sweden[3,13,14] beginning with a report of Prof. Holmboe at the Paris Academy of Sciences in 1864 about the use of weights in the form of animals in Norway in the fourteenth century. Similar weights are already known from ancient times: from Babylon there are the so-called trussed ducks (which may also be geese); from Egypt the form of lions and cattle, goats from Naples, and it will need further investigations to learn whether the well-known little animals (horses, goats, etc.) found in Luristan in Southern Persia (probably in a culture of *ca.* 1500 B.C.) may not also have been used as weights (see Fig. 8). It seems proper to question whether this form of weight has been an independent Scandinavian invention or whether it too has been created under Oriental influence. The form of a lion or tiger is especially suspicious in this respect. In this connection attention may also be called to the discoveries at Birka (Fig. 4, table 153)[1] where an object is shown which looks exactly like those typical weights of the late kingdom of Egypt known under the name of snake heads (Weigall).[12]

Apparently the first to call attention to the fact that scales and weights found in Viking graves do not stem from Rome, as previously suspected, but from the Orient, was Arne in 1914.[2] His comparison of early Scandinavian weights led him to the conclusion that the unit used in fabricating these weights comes very near to the drachm of the Sassanides (4.25 gm.). This is a moot question because most of the Viking weights are not in good condition; those of iron may or may not have lost their bronze cover; their weight may have been reduced by wear and tear and be less than originally, but it also may have been increased by incrustation and oxidation. Cogent conclusions about the system of their standards may therefore be difficult. Arne seems not to have been aware of the widespread use of the cubo-octaëdric form of weights in Islamic countries from mediaeval times up to the nineteenth century. In earliest times this form succeeded the Roman type of segmented spheres and segmented double cones. The persistence of such typical forms goes through many centuries. Segmented spheres and double cones are also found in Viking graves, and the much later form of spheres with pentagonal or with pentagonal and hexagonal facets have been coëxistent in Islamic countries into the eleventh century. This can be proven by the fact that in the collection of this writer each of these two types is represented by a specimen with legible marks, indicating that they were both used in the eleventh century. Achanti gold weights from the eighteenth or nineteenth centuries (eight specimens in this writer's collection) represent the most recent use of this Roman-Byzantine-Islamic form of weight known to this writer. They, too, have probably been made according to the typical Islamic original weights which somehow must once have reached the west coast of Africa. We also know[8] that the type of Byzantine weight in the form of a round disc, even with the typical Byzantine inscription and the sign of a cross, was used with Arabic validation in the eighth century. All this proves the tenacity with which older popular forms in daily use have been repeated time and again through centuries and, as in the case of the cubo-octaëdric form of weights, over a millennium.

The cubo-octaëdric form of weights as ornaments on jewelry, as already mentioned, can be seen not only on bracelets but also on other objects as depicted, for example, in Arbman's book on Birka (table 125, 2b, 2c)[1] and in other discoveries. All this is but another bit of evidence supporting the well-known fact that

the influence of Islamic countries extended over all of Europe in the early mediaeval period.

Wendell Wilkie's idea of one world is not entirely a new one; in different forms and under different conditions the conception was present in Viking times.

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William Combe and John Hunter's Essay on the Teeth

HARLAN W. HAMILTON*

MEDICAL historians and students of literature alike are indebted to Dr. Lloyd G. Stevenson for bringing to light Sir George Lefevre's account of his conversations with William Combe in 1820.[1] None of Combe's biographers has previously remarked this vivid and sympathetic picture of the garrulous old man in Thavies Inn, talking of the books he had "written," discussing metaphysics, eating gooseberry tarts, and reading aloud from his work then in progress, *The Second Tour of Dr. Syntax*.

It would seem that Combe, like Lefevre, enjoyed the comforts provided by that inn, for in the course of the *Second Tour* he sent Dr. Syntax to stay at the same place:

> For free from the street's rattling din,
> He found repose in Thavies Inn,
> Where from the town's unceasing riot,
> He could enjoy his time in quiet.

And at the end of his stay in London, Syntax indites a curious paraphrase of Shenstone's famous lines:

> Wherever he is doomed to go,
> In this meand'ring scene below,
> In the world's busy to and fro,
> He never will, in all its din,
> Forget the good of Thavies Inn.[2]

Of present concern, however, is that part of Lefevre's narrative in which he says that Combe claimed to have written John Hunter's "essay on the teeth for him."[3] Dr. Stevenson examines this claim in his article, asserts that it refers to Hunter's *Natural*

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1 Stevenson, Lloyd G. The elder Spence, William Combe, and John Hunter. *J. Hist. Med.*, 1955, *10*, 182-196, citing [Lefevre, Sir George W.] *The life of a traveling physician.* London, 1843, I, pp. 78-84.

2 [Combe, William.] *The second tour of Dr. Syntax, in search of consolation.* London, 1820, pp. 251, 274-275. Thavies Inn had originally been an Inn of Chancery appertaining to Lincoln's Inn. It had passed into private hands in 1771, had subsequently burned, and by the time of Lefevre's visit had been rebuilt as a group of eight separate buildings surrounding a quiet courtyard. Located on what is now Holborn Circus, the buildings were partially destroyed in the 1860's to make way for the Holborn Viaduct. An office building recently constructed on the site perpetuates the name.

3 Lefevre, *op. cit.*, p. 79.

History of the Human Teeth (London, 1771), and concludes that it is "by no means improbable," though necessarily "unproved," that Combe acted as ghost-writer in the production of this book.[4] The present article proposes to review Dr. Stevenson's argument, introduce some further evidence, and suggest a somewhat different conclusion.

It will first be necessary to correct and slightly amplify the biographical data which Dr. Stevenson has employed in establishing his case. William Combe was born in London, 25 March 1742.[5] He attended Eton College for at least four years, leaving in 1756.[6] His inheritance, so greatly exaggerated by legend, was probably not in excess of £4,000, half of which he received in 1763, the rest in 1766.[7] Combe was married in London on 16 May 1776.[8] He was committed to the King's Bench prison for debt on 25 October 1785, and discharged on 25 May 1787; he was recommitted on 9 May 1799, and lived within the rules until his death, 19 June 1823.[9] On these documented facts the biographer of William Combe must arrange a wealth of contemporary gossip, anecdote, and conjecture; and within these limits he must undertake to establish Combe's bibliography.

It is the latter problem which most concerns the scholar today, and a puzzling problem it is. Well over one hundred works have been ascribed to Combe by various writers, sometimes on very slight grounds indeed. Only two of these works, both posthumous, bear Combe's name on the title page; many, however, bear the names of other men, some of them very well known indeed. Dr. Hunter would be in good company if his name were to be added to this list, and in view of Lefevre's evidence Dr. Stevenson's suggestion is not unreasonable. It nevertheless has a special impor-

[4] Stevenson, *op. cit.*, pp. 195-196.

[5] Montgomery, Franz. The birth and parentage of William Combe. *Notes and Queries*, 1941, *180*, 254-257.

[6] Austen-Leigh, R. A. *The Eton College register, 1753-1790*. Eton, 1921, p. 118. The earliest surviving school list, dating from the spring of 1753, contains Combe's name. Whether he was at Eton prior to the year 1752-1753 is not known.

[7] Montgomery, *op. cit.*, summarizes the wills of Combe's father, Robert, and his godfather, Alderman William Alexander, both on file at Somerset House, London. The father died in October, 1756, leaving Combe property worth perhaps £1,500 to be held in trust until he should be 21. Six months before his twenty-first birthday, his godfather (and by that time his guardian) also died, leaving him an annuity of £50 to be paid until he should be 24, when he was to receive £2,000. It it possible that Combe also received something from the estate of his maternal grandfather, Humphry Hill, who died on 24 March 1740. *(Digested copy of the registers of burials of the quarterly meeting of London and Middlesex, 1700 to 1749*, a manuscript preserved at Friends House Library, London.)

[8] Chapman, John H., Ed. *The register book of marriages belonging to the parish of St. George, Hanover Square, in the County of Middlesex*. London, 1886. I, 264.

[9] King's Bench commitment book, numbers 10 and 16, Public Record Office, London.

tance for the student of Combe's career, for if Combe did write or edit Hunter's *Natural History of the Human Teeth,* that work must now be listed as the first of his many publications. It precedes by more than two years any work hitherto believed to be his.

Bibliographies of Combe begin with a list of his works which he himself drew up a few days before his death. This list, published in the *Gentleman's Magazine* for May, 1852,[10] mentions some 75 titles and refers to other works less specifically. It makes no distinction between works which Combe had actually written and those which he had merely edited; the friend who had requested the list (Rudolph Ackermann, the publisher of *Dr. Syntax)* had asked merely for "a list of all the works you have wrote or sent to press." Despite all its shortcomings—for it must have been compiled largely from memory and many of the titles are imperfect—this memorandum has been an indispensable aid to bibliographers. Combe may have had relatively little responsibility for some of the works he mentions, and some things which he was entitled to include are omitted. But it has never been found that he claimed any work in which he had not in fact had some hand. No book by John Hunter is named, though as Dr. Stevenson points out such a book as the *Natural History* might well come under the following general classification:

> I could also name some works of no inconsiderable size and reputation in which I have been sought to act as a pioneer by clearing away what appeared to me to be superfluous, to be entrusted with the task of improvement, either as to mode or to matter, to render reasoning more perspicuous, and to strew the path of truth with flowers. Of this I have been thought capable by those whose favourable opinion in any branch of literature would justify a rational pride; but such labours must be confined to my own bosom, and these works, in which I should be glad to acknowledge my share of the labour, and they are not a few, must be *nameless.* Such was the actual or implied condition of the remunerations I received from those whose names they bear, or to whom they are attributed.[11]

Whether or not Hunter's book was one of the works which Combe felt bound to pass over silently, this passage provides a useful description of the editorial duties which he must often have undertaken. It does not suggest the kind of work which was later to be called ghost-writing, in which a professional prepares an entire manuscript in the name of someone else. Rather it sets forth the responsibilities, as Combe saw them, of a good editor,

[10] Cole, Robert. William Combe and his works. *Gentleman's Magazine,* 1852, *n.s. 37,* 467-472.

[11] *Ibid.,* p. 468.

the kind of operation which must often be performed on a manuscript after it has left the hands of an author, particularly if he be a nonliterary man. In private conversation Combe was not unwilling to claim as his own any book which he had thus edited, whether his duties had involved extensive revision and rewriting or merely routine correction and preparation for the press. He might hesitate to include a book like Hunter's in a formal list of his writings, but he would be fully capable of dropping Hunter's name while chatting with an impressionable young doctor like Lefevre. In any event, his explicit reference to the famous treatise merits careful examination:

> A young physician must publish himself into practice, or he will find it an uphill concern. I have helped more than one in this way. Nay, John Hunter was the worst writer that ever took pen in hand. I wrote his essay on the teeth for him, and it was a hard job too; for not only could I not understand him, but he evidently did not comprehend his own meaning. It was an Herculean labour to him to compose a sentence, and a week's work to make it intelligible, and yet he was a most extraordinary man, and the most laborious one I ever knew.[12]

Combe's characteristic exaggeration is fully apparent in this passage. He could no more have written a book on the teeth than he could have spent literally a week revising one sentence. But this was his own lively way of saying that he had had a hand in getting Hunter's famous work through the press. Hunter had written the sentences and Combe had undertaken to make them intelligible. No long-term collaboration would be required for Combe to perform this essentially routine editorial task; the book is quite short, and a few weeks—more probably only a few days—would suffice. No doubt Dr. Stevenson is quite right in saying that "it is beyond finding out whether or not Combe was in London when the *Natural History* . . . was being written."[13] To have edited the book, to be sure, Combe would have had to be in London only briefly during the late autumn of 1771, for it was not published until December 3.[14] But more important questions are whether any London bookseller would have deemed Combe competent to undertake such a responsibility at that time, and if so whether Combe was in any position to accept it. As another medical man once remarked, these, though puzzling questions, are not beyond all conjecture.

12 Lefevre, *op. cit.*, I, p. 79.
13 Stevenson, *op. cit.*, p. 192.
14 *London Chronicle*, 3 Dec. 1771.

Although the many anecdotes about Combe's life at this period are exasperatingly vague as to time and place, they tend to fall into a recognizable pattern: Combe's education, whatever it finally consisted in, and his Continental travels, wherever they may have taken him, were ended by "about the year 1768" when, as a contemporary later recalled, he was living "in a most princely style" at the Bristol Hotwells.[15] There, and later in London and elsewhere, he attracted much attention for a short time, spent the remainder of his inheritance, and ran up large debts. The inevitable collapse of his fortunes occurred in 1770. There is no reason to suppose that he had turned his hand to any useful work prior to his downfall.

Combe himself must have encouraged the legend which subsequently developed concerning the adventures which now befell him, making them out to be highly romantic. The facts, could they be known, were probably quite otherwise. It was necessary for him to disappear, and disappear he did. Whether he fled to France or remained in England, whether or not he enlisted in the army and whether or not he served with it in Spain, whether he worked as a waiter in Swansea or as a cook in the Catholic college at Douai (various accounts insist simultaneously on these expedients), it seems unlikely that he was available at the moment for literary assignments.

Friends evidently helped Combe back on his feet, though just when, where, or how cannot be ascertained. The stories tend to agree only in placing him in the West Midlands or in Wales from 1771 to September, 1775. He was possibly rescued from the army at Wolverhampton (or perhaps Derby) in 1771 or 1772.[16] It may have been somewhat later that he was recognized as a waiter in a Swansea inn.[17] He pretty certainly edited Thomas Falkner's *Description of Patagonia* for a Hereford printer and bookseller in the latter part of 1773; the book was printed in that city and published there and in London on 27 January 1774.[18] He published three books in Bristol in the summer of 1775.[19] On 11 September 1775, the company of actors then playing in Bristol pro-

15 The author of "Dr. Syntax." *Bristol Observer*, 16 July 1823.

16 Campbell, Thomas. *Life of Mrs. Siddons*. London, 1834, I, p. 45*n*. Farington, Joseph. *The Farington diary* (James Greig, Ed.) London, 1922, I, p. 169. Smith, James. *Memoirs, letters, and comic miscellanies*. London, 1840, I, p. 19*n*.

17 Campbell, *op. cit.*, I, p. 42*n*. Farington, *op. cit.* I, p. 169.

18 *British Chronicle. Or, Pugh's Hereford Journal*. 13, 20, and 27 January 1774. *London Chronicle*. 25-27, 27-29 January 1774.

19 The dates of these publications as announced in the Bristol newspapers were as follows: *The philosopher in Bristol*, 12 June; *Clifton, a poem*, 3 July; *The philosopher in Bristol, part the second*, 26 July.

duced his one-act play, *The Flattering Milliner; or, a Modern Half-Hour,* "written expressly on this occasion by a gentleman residing near this city."[20] That he was already looking toward London, however, is evidenced by the publication there on 11 July of *Sterne's Letters to His Friends on Various Occasions,* a work edited and largely fabricated by Combe.[21] He must have gone to London in the latter part of 1775 or early in 1776; he was married there, as we have seen, on 16 May 1776, and he appears to have lived there almost continuously for the next half-century.

However one reads the record of these years, there is little room to suppose that in 1771 a London bookseller would have thought Combe a proper person to edit Hunter's *Natural History.* For that matter, it is most unlikely that Combe was either near London or free to undertake any editorial responsibility just then had it been offered him.

Dr. Stevenson acknowledges that there seems to be no internal evidence of Combe's hand in this book and frankly says that "to believe in Combe as John Hunter's 'ghost' one must rely solely on his unsupported statement as transmitted by Lefevre."[22] But Combe's unsupported statements were notoriously unreliable. No one has viewed them with greater suspicion than his own close friends unless it be the scholars who have studied his career. Henry Crabb Robinson, Combe's friend and for some years his associate on the *Times,* tells how he was warned against believing everything Combe said. He quotes Peter Fraser, another *Times* man, as follows:

> You must believe nothing he says that is about himself. What he relates is often true, except that he makes *himself* the doer. He gives us well-known anecdotes and only transfers the action to himself.[23]

This admonition goes largely unsubstantiated in the published portions of Robinson's diary, though in the entry for 4 February 1817 a long account of Combe's conversation is followed by the laconic remark, "How much of all this was true I cannot pretend to decide."[24] Unpublished portions of Robinson's manuscript, however, contain further references to Combe which show this scepticism of his veracity as the attitude generally held by his

20 *Felix Farley's Bristol Journal.* 9 September 1775.
21 *London Chronicle.* 11-13 July 1775.
22 Stevenson, *op. cit.,* p. 195.
23 Robinson, H. C. *On books and their authors* (Edith J. Morley, Ed.) London, 1938, I, p. 12.
24 *Ibid.,* I, p. 203.

friends. A good example is the entry for 18 June 1816, in which one of John Walter's dinner parties is described:

> C[ombe] was very amusing—He told anecdotes as usual—all of them possibly true but mixed up with personal falsehoods in his way—That is *he* is represented as a party to the transactions—For instance relating today the history of the Duchess of Kingston's two marriages & the letters &c that passed between the parties—he said—I know this to be true for I was with Lord Harvey then at Bath and I saw him turn pale as he opened the letter—This is quite a comic infirmity, carried as it is to such an excess that it can deceive no one.[25]

Various casual references in the manuscript are even more telling. On 16 November 1812, Combe "was very amusing & in his manners gentlemanly. He did not lye so much as usual." On 28 November 1812, Porden "spoke of old Coomb and of his infirmity as every body does." On 20 May 1813, "Old Coombe was not amusing & told but one lie." These references display a mixed attitude of tolerance, boredom, and affection. "Old C was as he generally is, entertaining" (1 February 1814). He was obviously a "character" for whom Robinson felt some regard, but one whose unsupported assertions were always silently discounted.

This is by no means to say that Combe's words to Lefevre must be rejected out of hand. As we have seen, Combe's bibliographical claims have been found consistently to have some factual basis, however slight. But the evidence must be carefully sifted. Fortunately in this instance some evidence is forthcoming. For there is nothing in Combe's own words specifying Hunter's *Natural History* as the "essay on the teeth" which he was claiming. The words may apply equally to the second part of that work, *A Practical Treatise on the Diseases of the Teeth; Intended as a Supplement to the Natural History of Those Parts.* This work was published in 1778, and thereafter the two parts were bound together and sold as a single volume. Dr. Stevenson mentions the possibility that Combe was referring to the *Practical Treatise* but regards it unlikely because "the second work was surely a less difficult one to prepare than the original *History*" and also because by 1778 "Hunter had been in practice for approximately fifteen years and did not fit the circumstances suggested by the context of Combe's assertion."[26] Neither reason seems very strong, particularly if one suspects that Combe's assistance was limited to rela-

[25] The voluminous manuscripts left by Henry Crabb Robinson are preserved at Dr. Williams's Library, Gordon Square, London. These passages concerning Combe are quoted with the kind permission of the Rev. Roger Thomas, Librarian.

[26] Stevenson, *op. cit.*, p. 196*n*.

tively unimportant editorial matters, and if one considers the evidence which points toward the *Practical Treatise* as the work Combe had in mind:

1. The date, 1778, is not inconsistent with Combe's known activities at the time.

2. By that year he had already demonstrated his editorial abilities with Falkner's *Description of Patagonia* (1774) and *Sterne's Letters to His Friends on Various Occasions* (1775).

3. Two London booksellers had jointly issued the second of these works. One of them—G. Kearsly—had subsequently published another product of Combe's handiwork, the sensational *Diaboliad* (1777).

4. The other bookseller who had been involved in the publication of *Sterne's Letters* was the same James Johnson who had issued Hunter's *Natural History* in 1771 and who was by 1778 looking about for a competent man to see the *Practical Treatise* through the press.

5. By that time, furthermore, Combe had made an excursion into the medical field, having edited—apparently in 1776—the *Oeconomy of Health,* a free translation of the famous medieval tract known either as the *Schola Salerni* or as the *Regimen Sanitatis Salernitanum.* Handsomely printed on good paper, it had carried on its engraved title page the names of several leading booksellers: "Mr. Almond, Piccadilly, & Messrs. Becket & De Hondt in the Strand, & Mr. Newbery, St. Pauls Church Yard."[27]

6. The *Practical Treatise* is not without internal evidence of Combe's hand, for it contains an introduction unlike anything in the *Natural History* but very similar in style to things known to have been written by Combe.

Anyone who has examined Combe's hackwork is all too familiar with a grandiose manner which he often affected—flowing periods elaborating the obvious with verbose parallelisms. This was the style he habitually adopted when undertaking, as he put it, "to strew the path of truth with flowers." Thus, in his Introduction to the *Oeconomy of Health,* Combe wrote as follows concerning the interpolations introduced into that work:

[27] The date of this obscure work is established only approximately by a brief mention in the *Monthly Review* for July, 1776, first noted by Professor Franz Montgomery. A search of the contemporary newspapers has failed to reveal any announcement of its publication, and the Registers at Stationers' Hall do not list the title. Combe mentions the work in the *Gentleman's Magazine* bibliography, but an examination of the book suggests that he wrote only the introduction and prepared the translation for the press.

The reader is also desired, without farther apology, either to pardon, pass over, or obliterate, as he judges proper, those lines which are interspersed thro' the poem, printed under double commas—the *Schola Salerni* is not accountable for any of them—their author thought they might not in general much displease the public, as they give this work the air and appearance of a modern composition; but if those who peruse this piece should have a less favourable opinion of them, they are intreated not to suffer hipercritical severity to supercede literary candor; but to recollect, that inadequate execution, should conciliate some lenity, where universal benevolence, animated the delinquent. A generous mind will rather incline to consider him as unfortunate than unpardonable.[28]

A paragraph (punctuated with a multitude of commas as a single sentence) may also be quoted from Combe's Introduction to *Sterne's Letter to His Friends on Various Occasions:*

The odious light in which many posthumous publications are deservedly viewed, by the discerning few, would have sunk these letters in oblivion, if they had reflected the least discredit on the morals or literary merit of an author who so justly deserves the very distinguished attention he has received; but, on the contrary, as they reflect honour on the author in every capacity, and place him in the most pleasing point of view, and as they carry with them evident and convincing marks of originality, he thinks the most incredulous must applaud his undertaking, and be fully satisfied of their authenticity, as he would be always happy to add to, rather than diminish the lustre of literary fame; thinking it almost as criminal to commit a literary as a corporal murder.[29]

Combe could seldom resist the opportunity offered by an introduction to display his rhetoric; indeed, the fact that Hunter's *Natural History* contains no introduction is in itself a kind of argument against Combe's editorship. That work contains only the following short Advertisement, here quoted in full:

Most of the Observations contained in the following Treatise were made by the Author before the year 1755; and the Substance of them constantly demonstrated after that Period, in Dr. Hunter's Course of Anatomical Lectures. The Figures were drawn by Mr. Rymsdyk, under the Author's Direction, and engraved by Mess. Strange, Grignion, Ryland, and others.[30]

By contrast with this terseness, the Introduction to the *Practical Treatise* runs to three pages, beginning as follows:

The importance of the Teeth is such, that they deserve our utmost attention, as well with respect to the preservation of them, when in an healthy state, as to the methods of curing them, when diseased. They require this attention, not only for the preservation of themselves, as instru-

[28] [Combe, William, Ed.] *The oeconomy of health.* London. [1776], p. xv.

[29] [Combe, William, editor and part author.] *Sterne's letters to his friends on various occasions.* London, 1775, pp. [i]-ii.

[30] Hunter, John. *The natural history of the human teeth. London,* 1771, p. [v].

ments useful to the body, but also on account of other parts with which they are connected; for diseases in the Teeth are apt to produce diseases in the neighboring parts, frequently of very serious consequences; as will evidently appear in the following Treatise.[31]

After introductory paragraphs in this elaborate manner, the book reverts to Hunter's knotty, downright style—which by comparison is seen to have redeeming qualities not previously suspected.

It appears, then, that Combe's claim to Hunter's "essay on the teeth" is not entirely unsupported if it is taken to refer to the 1778 volume rather than to that published in 1771. One certainly need not go so far as to think that Combe acted as Dr. Hunter's "ghost," much less that he helped that distinguished physician to "publish himself into practice." If Combe seems to have claimed these things in his conversation with Lefevre, he was doubtless only revealing once more that "comic infirmity" of which Crabb Robinson wrote. But the external evidence, circumstantial though it be, and the internal evidence of the elaborate Introduction combine to suggest the element of truth in Combe's off-hand remark. And future bibliographers of John Hunter and of William Combe may be well advised to list the *Practical Treatise on the Diseases of the Teeth* as written by the one and edited by the other.[32]

31 Hunter, John. *A practical treatise on the diseases of the teeth.* London, 1778, p. [i].

32 It may be noted that still another physician probably visited Combe at Thavies Inn or was visited by him at 13 Bedford Place, only a short walk away. This was Dr. David Uwins (1780?-1837), Combe's friend and medical adviser during the last years of his life. Dr. Uwins received his medical training at Edinburgh, was admitted licentiate of the Royal College of Physicians in 1807, and in 1815 became physician to the City dispensary. In later years he became widely known for his study of mental disorders. A writer in the *Literary Gazette* for 18 October 1823 speaks of him as one "whose friendly attentions to Mr. Combe smoothed, as he acknowledged, his passage to the grave." The proximity of Dr. Uwins' residence must have been an additional reason for Combe's enjoyment of Thavies Inn—far as it was from the King's Bench area to which Combe was supposed to confine his activities. And the humor of the satire on physicians in the *Second Tour of Dr. Syntax* is heightened by the knowledge that Combe, gaily flaunting his seventy-eight years, probably read the relevant passages to Dr. Uwins as well as to Dr. Lefevre. The latter noted that Combe "was the mortal enemy to physic, and had done without it for eighty [*sic*] years; but he believed physicians to be the most useful, as well as the most learned body of men living; he had implicit faith in them." (*Op. cit.*, p. 84.)

The Resident House Staff at the Opening of the Boston City Hospital in 1864

HENRY R. VIETS*

WHEN the Boston City Hospital, with its two hundred beds for medical, surgical, and ophthalmological patients, was ready to be opened on 1 June 1864, a resident staff of five young men had already been chosen as house officers. None of these men had yet received his M.D. degree from Harvard Medical School when they were appointed, four being in their third or final year and one in his second year. The visiting physicians and surgeons had appointed Dr. John Homans, a physician, as chairman when they first met in February of 1864. Services of four months each were arranged for the visiting staff, and it was decided to appoint five house officers, two in medicine, two in surgery, and one in ophthalmology. A special meeting of the visiting staff was held at the Massachusetts Medical Society in March to examine candidates. In consequence of the exigencies of the Civil War the graduating class of the Harvard Medical School had largely entered the Army and Navy services, and no candidates presented themselves for the examination. The physicians then turned to the trustees, requesting that they be allowed to consider students in the second or third year of their studies as candidates for house officers, and at a second examination on 1 April 1864 six candidates having appeared, five were chosen for these appointments. The resident graduate surgeons, as they were called, were Michael Freebern Gavin (1844-1915) and David Francis Lincoln (1841-1916), both members of the class of 1864. The resident graduate physicians were John Dole (1838-1872), also of the class of 1864, and Clarence John Blake (1843-1919), who was to graduate in 1865. The externe in the ophthalmic department was Edward Greely Loring (1837-1888), another member of the class of 1864. None had received his medical degree at the time of appointment, but all were accredited students at the Harvard Medical School whose degrees would be granted before they began their service in June. Mr. Basil Gavin, son of Dr. Gavin, has recently presented to the Boston Medical

* Curator, Boston Medical Library, Boston, Massachusetts.

Library an excellent photograph of these fine young men (Fig. 1), each of whom was to have a distinguished career in medicine or surgery. The group looks rather older than their years, at least from our point of view today. They wear the heavy black frock coats of the period, unpressed wool trousers, high boots, starched collars, vests, and heavy watch chains—quite different from the white-coated, thinly dressed house officer of today. Two wear moustaches and one, in addition, a beard.

The new city hospital, which had just been completed,[1] must have been an interesting place for these young men in 1864. It consisted of two parallel pavilions of two stories each, with an attic and basement, and connected at one end by an open, quadrant-shaped colonnade which led to a central administration building, also two stories in height, capped by a dome. Built in the French Renaissance style, the buildings were considered handsome structures in their day, and indeed they had considerable beauty, particularly the effective open colonnade. A graphic idea of the hospital as it was in 1864 can be obtained from a drawing (Fig. 2) made from the south side and showing the medical pavilion, the administration building with the colonnade in between, and the surgical building in the rear on the north side. Pavilion I, with four wards, was for surgical patients, as it is today, and was under the care of Lincoln and Gavin. Pavilion II was similarly planned for medical patients, also with four wards, under Dole and Blake. The second floor of the administration building had rooms for private patients, and the rooms in the third or attic story were assigned partly for employees, partly for the ophthalmological patients under Loring. The operating theater was in the dome above Loring's ward. At first there were plans for two hundred beds, but soon it was necessary to allocate to patients the rooms on the top floors of the pavilions which had originally been for employees.

The arrangements for operations on surgical patients were most inconvenient. The patients had to be carried across the open colonnade from the surgical pavilion to the administration building and then moved upstairs in a lumbering hand elevator to the operating room in the dome. This awkward arrangement prevailed, however, for twelve years, being abandoned in 1876 long after the original staff had left the hospital.

[1] *A history of the Boston City Hospital from its foundation until 1904.* Ed. by a Committee of the Hospital Staff. Boston, 1906.

FIG. 1. Boston City Hospital Resident House Staff at Opening, 1864. *Standing:* John Dole and Michael Freebern Gavin. *Sitting:* David Francis Lincoln, Edward Greely Loring, and Clarence John Blake.

FIG. 2. Boston City Hospital, Southwestern elevation, 1864. (From *A History of the . . . Hospital*, Boston, 1906).

We now know something of these five young men who became the first house officers of the Boston City Hospital, and it is interesting to see where they came from and how they succeeded later in life, for they were a dedicated group who appear to have been devoted to their hospital patients and indeed turned out to be exceptionally fine physicians after their graduation.

The first to be considered is John Dole. Born at Augusta, Maine[2] in 1838, he was 26 years old when the group photograph was taken. As a young man he acquired rheumatic fever, accompanied with endocarditis and nephritis. These illnesses so affected him that he was never a well man, and, as we shall see, died at the age of 34 of an acute heart attack. Dole entered Amherst College as a freshman in 1857, and was graduated in 1861. He then proceeded to the Harvard Medical School for a three-year course, which was standard at that time, and was graduated in June 1864, at the same time assuming his house officership at the Boston City Hospital. Dole was an earnest, hardworking student and continued to be a serious practitioner of medicine during his hospital days and afterwards as a surgeon and obstetrician in Amherst when he returned to his college town after leaving the City Hospital. Before doing so he made an extended journey to Europe over a period of nine months, continuing his studies and making some restitution of his health which had been severely affected by his work at the Boston City Hospital. Having returned to Amherst, he married, settled down into practice, and was soon involved in an arduous daily routine which he supplemented by extensive reading and writing in the evening. Apparently he read the best medical literature of the day and kept up his interest in European advances about which he had learned on his trip. These scholarly researches resulted in a paper of more than ordinary interest, "The Practical Aspects of Medical Science," read at the annual meeting of the Massachusetts Medical Society on 7 June 1871.[3] He made a plea for scientific advancement in medicine at a time when many practitioners considered a physician who took any interest in experimental work or research as "impractical" or "wanting in common sense." He also made a plea for the use of four instruments, just coming in to widespread use in 1871, which he felt no wise man should ignore, particularly as an aid to critical examinations. These new-fangled toys, as

2 L. The late Dr. John Dole, of Amherst, Mass. *Boston med surg.* J., 1872, *86*, 410.

3 Dole, John. The practical aspects of medical science. *Publ. Mass. med. Soc.*, 1872, *3*, 253-272.

many of the general men referred to them, were of course the microscope, stethoscope, ophthalmoscope, and thermometer. The four, he wrote, "should be employed judiciously, as subsidiaries, not substitutes, when unaided sense fails. All power, every instrument, all knowledge of each and every branch of medicine, all faculty of clear or logical reasoning, should be brought to bear upon our diagnosis. No supposition should satisfy when exact knowledge is attainable." Thus Dole set a high standard at a time when there was considerable laxness among practitioners, and he upheld the best traditions of the profession, although practising in a relatively small town and not actively connected with a medical school or large hospital.

About the time he delivered his paper Dole's health began to fail rapidly; there was a return of the nephritis accompanied by severer symptoms of endocarditis. He got through the winter but was advised to take another trip to Europe in the spring. He sailed from New York on the 6th of May, 1872, and died suddenly on the ship as it was nearing the English coast. As Dole's biographer wrote, his whole brief life was characterized by a "devoted attention to his patients, and untiring energy in the pursuit of clear ideas in medicine; a fervid indignation at wrong, and an enthusiastic recognition of whatever was noble and honorable; unchangeable attachments to friends, and unrelenting sternness towards the one capital sin of unfaithfulness." This tribute, written by "L", could have come only from David F. Lincoln or Edward G. Loring, both brother house officers at the City Hospital and contributors to *The Boston Medical and Surgical Journal* in 1872. Although Dole's life was short, one feels that it was complete in the sense that he was able to carry out the high ideals which he had established for himself when attending the Harvard Medical School and as a house officer. His appearance in the photograph is that of an earnest, sober, thoughtful man, rather older than his brother house officers. One can say without much question that they must have admired the deeper characteristics of his nature, his reverence, his faithfulness, and his sincerity. The visiting physicians chose wisely in picking out such a dedicated man to become resident graduate physician in 1864.

Standing beside Dole in the photograph, taller and thinner and with his right hand tucked in his coat in a Napoleonic gesture, is a man six years younger, his classmate Michael Freebern

Gavin, who turned out to be one of the most unusual men ever to practise in Boston. Certainly up to 1864 he had led the most dramatic life of all the five men under consideration. He was born in Roscommon, Ireland, his father having been a carriage builder.[4] His mother, Mary Freebern, was of Scotch descent, and her father had fought under Wellington at Waterloo. Four of the five boys in this talented Irish family came to America and each practised medicine here.

Michael came to this country in 1857, when he was thirteen years of age. His sister had married Patrick Morris, who had set up a drugstore in Boston, and the young boy, after crossing the ocean alone, came to live with them. He was fortunate in his school, the grammar school situated on lower Broadway in South Boston and presided over by William T. Adams (1822-1897), better known as "Oliver Optic." He developed a great regard for his teacher and this friendship continued all during Adams' life. Presumably due to his brother-in-law's occupation as a pharmacist, young Gavin was given special training in Latin and obtained a wide knowledge of materia medica. In 1861 he entered the Harvard Medical School for the three-year course of studies. Actually, although three years were necessary to obtain a degree, only two years had to be spent in the school, and the third year could be used either for military purposes during the Civil War or for work in some hospital. This bright, pleasant young Irish boy immediately attracted the attention of the Boston Brahmin, Dr. Oliver Wendell Holmes, who was then teaching anatomy and physiology at the Medical School and who recommended him highly for an appointment as acting assistant surgeon in the Navy although he was still a student and only 18 years of age. He was undoubtedly too young to be accepted, but the next year Holmes wrote again, and this time young Gavin received his appointment. He appeared in his uniform at Holmes's house, and we may be sure that Holmes gave him a royal welcome. The plans for the new City Hospital were being considered, however, during the winter of 1863-64. Like all medical students, Gavin thought it better not to take any chance of missing an appointment; he had his Navy assignment revoked in October 1863, and got Holmes in December to write a letter to the trustees of the Massachusetts General Hospital approving his application for the position of house pupil. Whether this was accepted or not we do not know,

[4] *Michael Freebern Gavin.* Ed. by his son. (Cambridge, 1915).

but when in April of 1864 he passed the examination for house officership at the Boston City Hospital and received an appointment, the application to the Massachusetts General Hospital was doubtless withdrawn.

The relationship between Oliver Wendell Holmes and this young Irish immigrant—tall, handsome, and with a twinkling eye, (and no doubt a real bit of Irish wit)—is an interesting one. Holmes saw something in Gavin which was more than usual, and indeed used his great influence to see that the young man was properly established. Gavin notes that "the poet Holmes has been one of my best friends," and Holmes in turn writes of Gavin as "an intelligent and very industrious student," and that he "had formed a very favorable idea of his capacity and disposition." Although Holmes was not on the staff of the Boston City Hospital, no doubt Dr. David W. Cheever, the surgeon, also saw something in this attractive young Irishman, otherwise they would hardly have chosen a boy of 20 as one of the first resident surgeons at the newly opened hospital.[5]

After finishing his house officership, Gavin entered the Army and had a short service in Virginia with a regiment of Massachusetts volunteers, but peace was soon declared and in August of that year he was mustered out. To complete his education he went abroad in September, first to Roscommon, his old home in Ireland, and then to Dublin, London, and Paris. He spent the winter in Paris, but by March of 1866 was back in Dublin where he took a four-month intensive course in surgery for a degree from the Royal College of Surgeons of Dublin. He could now write after his name, F.R.C.S.I., a distinction rare in America. The next year he returned to Boston and started private practice in South Boston which he continued up to his death in 1915. Gavin was one of the most successful practitioners of his era and at the same time served on the staff of the Boston City Hospital, ultimately becoming a senior visiting surgeon. A man of great culture, he took an interest in music and had a wide circle of friends in the literary and artistic professions. His library was outstanding, both in general literature and in medicine. He was blessed with a buoyant disposition and had a dry sense of humor. He was an inspiring teacher of many outstanding medical men in Boston, and few doctors have won such love and confidence

[5] The recommending letters by O. W. Holmes have been presented to the Boston Medical Library by Basil Gavin.

both from fellow physicians and from patients. He had developed all those attributes which Oliver Wendell Holmes had seen so promptly in the young Irish student.

Gavin's associate on the surgical side was his classmate David Francis Lincoln (1841-1916), the young man sitting on the left side of the group, dressed in a black frock coat, high vest, and heavy watch chain, and perhaps a little sober in his expression. He was three years older than Gavin and had graduated previously from Harvard College in the class of 1861.[6] Born in Boston, he came from an interesting family, for his father ran packet boats to California and Australia and also was one of the pioneers in the petroleum industry in this country. Thus young Lincoln was brought up in a well-to-do home where there must have been a good deal of the spirit of adventure, but so far as we know he never took advantage of the packet ships to Australia or any part in the development of oil. He was educated in the usual Boston schools, entered Harvard College at the age of sixteen, where he was a shy, quiet, and rather retiring student, although always respected by his associates. The year after he finished college he became assistant surgeon in the Navy and served from September 1862 to February 1864. But part of that time at least he was in attendance at the Harvard Medical School for he obtained his degree with the class of 1864. His internship with Loring, Gavin, Dole, and Blake was followed by a long trip to Europe, where he spent two years in medical study, specializing in neurology and psychiatry.[7]

On his return he practised for a number of years in Boston and was connected with the Boston Dispensary, but he was not particularly successful as a practitioner, for his blunt speech was frequently interrupted by long periods of silence. Giving up practice, therefore, he turned naturally to teaching, for he was primarily a scholar and exceptionally well qualified in both Latin and Greek. This enabled him to obtain positions in private schools and also at Hobart College in Geneva, New York, where he taught with great success. His leanings towards medicine, however, drew him back to Boston, and this time his career as a physician centered primarily around public health, hygiene, and schools. For many years he was actively engaged in the work of

[6] Putnam, James J. David Francis Lincoln, M.D. *Boston med. surg. J.*, 1916, *175*, 693-4.

[7] Lincoln, D. F. The medical school of Berlin compared with that of Vienna. *Boston med. surg. J.*, 1872, *86*, 165-67.

the George Junior Republic and later espoused the cause of backward children in the public schools, spending a great deal of time in actually teaching certain of them and doing what he could to see that the needs of all were appreciated and met.

For many years before his death he lived in a modest apartment on Beacon Hill and spent most of his leisure hours in the Boston Athenaeum. Freedom from practice gave him time to read and write and to utilize his first-rate power of literary appreciation and criticism. He published many papers in medical journals and four books of considerable worth in their time. When connected with the Boston Dispensary in the early days of his practice as a neurologist he wrote *Electro-therapeutics: A Condensed Manual of Medical Electricity* (Philadelphia, 1874), which was a most useful book on a topic not well understood at the time, but widely used by inexpert practitioners. Shortly after this book was published he translated Trousseau and Pidoux's *Treatise on Therapeutics,* in three volumes, from the ninth edition (New York, 1880). This was followed by a book on *School and Industrial Hygiene* (Philadelphia, 1880), an excellent public health primer, and by an even better book, *Hygienic Physiology, A Textbook for the Use of Schools* (Boston, 1891). His most popular book (it went through three impressions) was *Sanity of Mind, A Study of its Conditions and the Means of its Development and Preservation* (New York, 1900).

Lincoln, because of his independent means, his quiet, rather shy character, his love for children, his intense interest in public health in all its aspects, and the fact that his personal characteristics did not lead to a successful form of practice, nevertheless accomplished more than the average doctor in life. He appears to have been an excellent teacher in the classics, and certainly his small books were most useful at the time they were written, and are full of sound, thoughtful, reasoned evaluations. Everything about Lincoln appears to have been precise and tidy, and he must have been an earnest, meticulous house officer, and, in spite of his shyness, a helpful colleague. Although Lincoln did not speak well, he could write with great force. Certainly his description of his roommate, Gavin, so orderly and sympathetic, is a splendid piece of writing, and I imagine if he thought Gavin was "always a sincere, clean-minded, brave-hearted gentleman," Gavin may have thought exactly the same thing about Lincoln. Lincoln must have been a little envious of Gavin whom he thought "positively

effervesced with high spirits," but he could match Gavin in seriousness, high purpose, and dignity, and indeed in devotion to his work. One gets the impression that Gavin, in spite of his youth, must have set the pace for the young house officers at the Boston City Hospital, but Lincoln was probably not far behind, although in a self-effacing manner, free from the light-heartedness which was so characteristic of Gavin.

A queer turn in the life of Lincoln, illustrating his diversity of interests, was his absorption with geology. While in New York in 1895 giving some lectures on pedagogy, he became assistant to the state geologist, and made a survey in Seneca County, published with maps and photographs. This, too, appears to have been a creditable piece of work, on a par with his accomplishments in public health, teaching, sanitation, and as a teacher of Greek and Latin in Hobart College. His life was far afield from surgery, but the rigorous training he obtained at the Boston City Hospital and particularly the influence of his brother house officers must have remained with him for the rest of his life.

The two remaining men in the group of five, Loring and Blake, were also physicians with outstanding qualifications when they joined the staff. They, moreover, became in their years of practice most widely known and distinguished physicians. Both became specialists, Loring as an ophthalmologist and Blake as an otologist, at a time when the practice of few physicians was circumscribed. Each contributed new ideas and established sound principles in his field of endeavor. Only Gavin can be compared with them in major accomplishments, but as a general practitioner, despite his high ideals, he left less of a mark on medical history. Dole died too young to be more than a vague memory of a dedicated man; Lincoln, the idealistic drifter, never really came to grips with his problems, although each was met with competence. The story of Loring and Blake, however, is quite different, for each made a distinctive mark on American medicine as it was being developed in the post-Civil War period.

Edward Greely Loring (1837-1888), was the oldest of the group. He looks almost fatherly in the picture, and Gavin, Lincoln, and Blake might be mistaken for his sons, with sober Dole as an elder brother. Actually, he was only 27 when appointed to the special post as externe in the Ophthalmic Department. That there was such a department in the City Hospital in 1864 was due to another pioneering spirit—Henry Willard Williams

(1821-1895), who after three years of intensive study in Paris, Vienna, and London with the best ophthalmologists of the time, was graduated from the Harvard Medical School in 1849. He began teaching in 1850 and became the first professor of ophthalmology in the School in 1871. In the meantime he was one of the founders of the American Ophthalmological Society in 1864, the year the City Hospital opened. Such a man could hardly be ignored in choosing the visiting staff of the new institution, and in Loring he found a man of his own stamp, who also had gone abroad when still a student in college to spend three years in Italy, particularly studying anatomy with Duranti at Pisa, before entering the Harvard Medical School. It was no doubt Williams who turned him toward ophthalmology and trained him so well, aided by the few patients under the eaves of the administration building.

When Loring came to the City Hospital he was already a mature and travelled physician. From his father, a professor in the Harvard Law School and later a judge in the United States Court of Claims in Washington, he inherited a fine, accurate, and meticulous mind. His long sojourn in Italy brought him in contact with European medical culture at its best, so that when he returned to Boston he was familiar with the medical standards of the time. Older than most of his fellow house officers and devoted to a special branch of medicine, cut off in his attic ward, he must have been a little apart, but I cannot help but feel that he won the respect of Lincoln and Gavin, Blake and Dole, although their interests were a little divergent. Certainly this friendly soul, with his broad background, leavened the group. When one or two could get away, the boating at his father's summer home in Winthrop was an attraction. His characteristics of leadership, so marked in later life, must have left their impression on the hard-working group in the winter of 1864-1865. Perhaps he did act as senior adviser in a parental capacity, as suggested by the photograph.

After his internship, he assisted Hasket Derby at the Massachusetts Eye and Ear Infirmary, then his marriage took him for a year to Baltimore and in 1866 to New York where he practised with great distinction during the last 22 years of his life. When he died suddenly in 1888 of a heart attack, as had Dole, he was one of the leading ophthalmologists in America and had an international reputation. His greatest contribution was in ophthalmic

physics; he improved the ophthalmoscope and won the applause of all Europe with the demonstration of his instrument at the Ophthalmic Congress in Milan in 1880.[8] In America, his two-volume *Text-book of Ophthalmoscopy* (New York, 1886-1891) became the leading text of the day, a standard work, finely organized and meticulously written.

Loring was universally liked and admired for his professional accomplishments. Although modest and refined, he was strong in his convictions. Socially he was a great favorite of all who came in contact with him. Fond of outdoor sports, he enjoyed yachting and was just about to launch a new boat, the third that he had built, when he died at the age of 50.[9]

Lastly we come to Clarence John Blake (1843-1919), who was destined to outlive all the others. In the photograph he is a stalwart figure, his pea-jacket giving him a nautical air of a ruddy sailor. Born in Boston and educated at the Latin School, he was still in his second year at the Harvard Medical School when he became a medical house officer at the age of twenty-one. After his internship, Blake went to Europe, first to study obstetrics in Vienna, and later to work in otology with Adam Politzer who selected him as an assistant, a great honor for an American in Vienna. Returning to Boston in 1870, he began his long association with the Massachusetts Eye and Ear Infirmary and the Harvard Medical School, finally reaching full professorship in otology in 1888. He was president of the American Otological Society in 1876, and edited four volumes of the *American Journal of Otology*. Blake had a keen, active mind, and was given to original investigation and controlled experiments. He was a daring but conscientious practitioner of aural surgery, one of the first in this country to make otology a specialty. In spite of his heavy build, Blake was exceedingly deft and skillful with his fingers, and because he was loath to cause pain, every action was carried out with unfailing kindness to his patients. He became a national and international figure in otology.[10] After Alexander Graham Bell had consulted him on the physiology of hearing in relation to the invention of the telephone, the directors of the company offered him a valuable post as adviser, but Blake was far too interested

[8] *Compte-rendu. Congrès Périodique International d'Ophthalmologie.* (Milan, P. Poncelletti, 1881.) 90 pp.

[9] *Boston med. surg. J.*, 1888, *118*, 462-3.

[10] Morse, Henry Lee. *Trans. Amer. otol. Soc.*, 1919, *15*, 18-20.

in medicine and continued his practice and teaching in the conscientious, accurate manner for which he was noted.[11]

Few hospitals can have been more fortunate in choosing their first house officers than was the Boston City Hospital in 1864. Five sterling men gave their services to the poor in a manner that must have served as a shining example for those that were to follow. Each in his turn became an outstanding physician, a credit to his community and to medicine. At least two became internationally famous, and each exemplified the best in medicine in the post-Civil War period.

11 Pritchard, Urban. *J. Laryng. Rhinol. Otol.*, 1919, *34*, 274-75.

Letters (1790-1800) of John Johnston, Rockbridge Medical Student and Doctor

CHARLES W. TURNER*

DR. John Johnston was born 15 November 1764 in Fishersville, Augusta County, Virginia, of Scotch-Irish parentage. His father, Zachariah, a leading citizen of his section, had attended Liberty Hall Academy (now Washington and Lee University) and served in the House of Delegates in Richmond where he had supported the Jeffersonian principles, sponsored the Bill for Religious Freedom, and favored ratification of the Constitution of the United States. The elder Johnston acquired a large amount of land in a number of western Virginia counties and in Kentucky, and about 1793 the family moved to Lexington, Virginia, where a substantial house called "Stone Castle" was built. This house stands today, with descendants of the Johnston family still residing there. In this place were found about twenty letters of John, written to his father, describing his student days in the Medical Department of the College of Philadelphia, founded in 1765, and letters describing his first practice and life in Staunton, Virginia.[1]

John attended the Old Field schools of that day and joined the Presbyterian church. Early in 1790, he decided to prepare himself for a medical career in the Medical School in Philadelphia or some place in Europe. Funds were insufficient for the latter, so he bade his family farewell and set out on a horse given him by his father, and arrived in Philadelphia early in the spring of that year. The first letter speaks of his settling in Philadelphia:[2,3]

Philedelphia, May 4th 1790

Dear Father,

I feel a secrett pleasure in communicating my sentiments to you at preasent. I arrived here the 20 of Aprile and entered under the tuition of one [of the] professing physicians of the College &c. The entring fee was £80 & board at the rate of £40 per year. The great demand for wheat and flour in Europe has augmented the price of boarding very much in this

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[1] Material taken from *Rockbridge County News*, August 16, 1934; John G. Paxton, "Zachariah Johnston", *Tyler's Genealogical Quarterly*, V. 185; Joseph A. Waddell, *Annals of Augusta County*, Staunton, Virginia, 1902, p. 340.

[2] This letter and subsequent Johnston letters quoted are to be found in the Johnston Family Collection in the Stone Castle, Lexington, Virginia.

[3] Capitalization and punctuation have been modernized to make for easier reading.

place. I could have had my tuition on much reasonabler terms from other physicians in the city—but there is a singular advantage a student has in entring in College which others have not. There is the dispensary & hospital under the direction of the professors of the College where we see various opperation[s] frequently on these diseased persons.

I am at preasent confined to my room with that infectious disease the smallpox, that has confined many to that gloomy room appointed for all living. I am happy to inform you the physician I study under treats me with every respect I could wish, and what adds to all his other amiable qualities, he has a sacred veneration for virtue. I board in family of a Mr. Tomkins who are much famed for hospitality, reputation and morality. I have a great deale more to communicate but the admonition of nature commands me to bid you adue.

Remains you[r] aff^{te} son,
sensible of the great obligation he
is under, both by the ties of N. & G.
Jo. JOHNSTON

P.S. My greater respects to Mamma & all the rest. Send a letter to Mr. [?]ificale and it will come safe by the bearer, Mr. Service.

Several months later a letter revealed more of his life and schooling.

Philedelphia, July 6th 1790

Dear Father,

The last paternal favour I received from you was by Mr. John Boys[4] which I have often perused with peculiar delight. I have nothing worth releating to transmit. Today's paper informs us the temporary residence of Congress is to be in Philedelphia & the permanent seat some where on banks of [the] Pottawmack. The 4 of this instant was the anniversary of American independence, that ever memorable period to the true sons of patriotism. The patriots in this place celebrated it in the most splendid manner. The Society of Cincinnati met at the State House and after congratulating each other on its return, marched in procession to Christ Church. The great Dr. Smith delivered a very sutible sermon the [torn]. On Sunday evening a sermon delivered by Mr. Blair your acquaintance from Virginia,[5] he with energy exorted to uni[on] and described the happy effects produced in political society's and with freinds and reletions as Christions. The happiness and prosperity flowing into a state and the fatal consequences of a party spirit were painted in glowing colours. Mr. Blackgrove sang an anthem which had a most inchanting effect (you know his voice is admirably melodious). The day every where was celebrated with unfeigned joy. The companies of artilery fired several salutes in honour of the morning. The bells over the whole city rang. Fireworks were exibited at the State House & many other grand exibitions. I expect to write to you by M. Perry in a few days. Adue.

I am with sentiments of
sincere affections your
dutifull son,
JOHN JOHNSTON

My sincere respects to Mamma
and all the rest.

[4] John Bowyer, early settler and large landholder of Rockbridge County, Virginia.
[5] John Blair was a minister from Richmond, Virginia.

After several months in Philadelphia John called on his father for money—a long established practice—saying:

Philedelphia, Sep^{r} 20 1790

Dear Father,

From my multiplicity of business I have been engaged untill the bearer is just about to set out. I will be in need of some money shortly; the best oppertunity of sending will be by Collo. Adrew More in December.[6] James has Collo. Lewis['s] bond of forty two pounds which may be had by applying to him.[7] The lectures on anatomy Meteri Medica, practice of physic, chymistry, botony, & natural philosephy will commence some time in October. Each lecturer's fee is six pounds. If possible send me some by Collo. More. I hope the period is coming when you will be convinced my time has not been ill spent in this place. I have an oppertunity of seeing every kind of opperation that can be performd on the human body, also the treatment of every kind of disease that is incident to the human system.[8] I have the happiness to be high in the estimation of the professers and students of the College. I had not been long in the city before [I] was elected a member of the *Philesophical* & *Litreture Societys* prior to my making any application to become a member.[9] Time commands an adue.

I am with sentiments of great affection your dutifull son,

Present my sinceare respects to Mamma & all the rest.

JOHN JOHNSTON

The following year John was still having financial difficulties but appeared to be progressing well in his studies.

Philedelphia Jan^{r} 8th-91

Dear Father,

I receiv'd yours of th28 of Octob^{r}—and was very sorry to hear that you enjoyed so poor a state of health. I have sold my creature for £13. If I go home in the spring I must go by the way of Richmond in the packett boat, but as a passage from here to Augusta anyway would be very expensive and would impede me in my studies, I am not determined whether I shall have the happiness of seeing you in spring or no. The professors will finish their course of lectures some time in March. I expect to take my degree some time next fall or early in spring. I bleive I could procure one sooner, but I wish to be well acquaint[ed] with my bussness. I am in great want of some money. I believe it will be best to pay Dr. Humphries his bill however large it is.[10] I never had any knowledge of the value of the bill. As to Burks, I never had borrowed a farthing from him.[11] When

6 Andrew Moore of Lexington was a member of Congress at the time.

7 Possibly Andrew Lewis of Augusta County. James was a brother.

8 Operations were performed at the Pennsylvania Hospital where the students went to observe.

9 This was no doubt a student organization.

10 Alexander Humphreys was the leading practitioner in Staunton, Virginia.

11 Burks was a local Lexington figure.

he desired to sell a horse less than so much [I] bought it. I am very much confined now.

Have not heard of any who wish to purchase land back.

I am your affectionate son,
JOHN JOHNSTON

Father Zachariah Johnston must have sent him a word of caution, for in reply John wrote:

Philadelphia, March 5th 1791

My dear Father,

I received yours of Decemb.r the 21, '90 fav.d by Mr. Grates Thursday last & one by Mr. White dat.d Janary the 29—today.[12] I sincearely thank you for your parental admonition & your parental offer. I read them with peculiar satisfaction & bedewed them with the tears of filial affection. They were not only pregnent with the most genuine affection, but also with real sentiment. It made my heart overflow with sorrow to hear Mamma was so near her final exit but now hope I may rejoice in her recovery. I had a very severe turn of the intermittant feaver, when I wrote you last but am now perfectly recovered. It is very sickly here at preasent, cheifly occasioned by the quick transitions in the air. I rarely ever go out to visit patients in the afternoon, but I see a train of mourners conveying some deceased relative to that mansion prepared for all living. Times fly; I must live well, for all must die.

Hemp has a very dull sale here at present.[13] As for public news I refer you to Col. More. Congress adjourns in a few days. I shall write you through him.

I am in great need of money. £10 will pay for the lectures.

I am your affectionate son,
JOHN JOHNSTON

To his mother he wrote at least one letter expressing concern regarding her health:

Philadelphia July 7th .91

Dear Mamma,

I hope you will pardon my long silence & accept these few lines as small acknowledgement of my gratitude to you for your maternal affection.

I expect to graduate early next spring when I hope to have the happines to see you once more. I have had a very clear proof of the utility or happy effects of inoculation this spring. We inoculated three hundred & odd patients without the loose of one. We attended thirty five that took it in the natural way, & out of that small number twelve died. Nothing speaks so forceible as facts; the great and emenent Doctor Kuhnn in last cours of lectures on theory & practice of physic told us that [he] had inoculated 2000 and had loost only one.[14] I am very closely confined to the business. I have never been out of this city since I arived here, and [I am] seldom ever in bed to eleven or twelve o'clock at night, beside

12 Both Gates and White were Rockbridge citizens.

13 No doubt his father who had raised hemp desired to know the price of it on the Philadelphia market.

14 Adam Kuhn was professor of theory and practice of medicine in the University of Pennsylvania and attending physician of the Pennsylvania Hospital.

attending to Doctor Say's[15] extensive private pra[c]tise I attend all the public receptacles for the poor viz. the Hospital, Bettering House & Dispensery.[16] It is here you may see poverty & disease united forming pictures of human woe; if you beheld this splendid city you would think distress was unknown in it, but the most calamatous scenes my eye ever beheld has been here. I live in a Quaker family at prsent. The[y] treat me with every mark of friendship. I have the happiness to be high in the estimation of the professors of the University. I have a great deal to communicate but a multiplicity of business commands me adieu.

I am with sentiments
of real affection your
obd^{t} son,
JOHN JOHNSTON

My compliments to Father
all the rest

Another letter to his father spoke of his progress.

Philadelphia, September 14th 1791

Dear Father,

I recived yours by Mr. Service[17] which gave me pleasure to hear you were on the recovery but sorry for the indisposition of *Mamma*. I am much astonish'd at Dr. Humphries recommending Rheubarb in hesteria or Costiveness. I am not acquaint[ed] with a medicine in Materia Medica more improper. It is the only purgative in nature which acts as an astringent. Its first opperation is chathertic, but it always leaves the . . . bowels more bound than before which I presume will shew you the impropriety of its efficacy in that disease. I have seen it administred in diarrhea with great utillity, nor is it less favour'd [?] in cholera where the proximate cause of the disease is debility. I would send some medicine by the bearer, but he has no convenience. But I hope I can send some in a few days by Mr. Boys.

The dysenteria or bloody flux rages here now as an epedemic and has been very mortal, but the late transition in our season seems to have check'd it in some measure.

Since I wrote you last, I have been appointend as an Assistent in the General *Dispensary* of *Philadelphia*, where I receive a compensation of £25 or 30 per annum, and if I continue any longer than I graduate I am intiteled to one hundred & sixty pounds per annum which I believe will not be an object sufficient to detain me longer than I graduate which I expect will be in Feb^{y}. I shall write you more fully by Mr. Boys. Betwixt the practice of Dr. Say's Dispensary and lectures of the professors I have not an idle moment.

I am your affectionate son,

Comp^{t} to Mamma & rest.

JOHN JOHNSTON

Though there are no more letters from John from Philadelphia, there was mention of him in one of Andrew Moore's letters. Writing from Philadelphia on 1 February 1792 to John's father he said in part:

15 Dr. Benjamin Say was an attending physician at the Philadelphia Dispensary.

16 Bettering House was the public almshouse. The Dispensary, established 1786, provided medical care to the city's poor.

17 Service must have been from Rockbridge County.

Your son informs me he will set out on Monday for home. I would have dissuaded him. But he informs me he can't obtain a degree until July and he has obtained from the professors such testimonials as will fully evince that he has acquired the knowledge necessary. Nothing is wanting but more compliance with form. This is wholly outside of my phase of study and I can give no opinion of his knowledge. But he has the entire approbation of his teachers both as to his conduct and his attributes.[18]

No more letters seem to be preserved until one written to his father after he had established his practice in Staunton.

Staunton August 8, '96

Dr. Father,

I hope by this time you enjoy better health. If the medicines should not agree [illegible] or produce the desired effect immediately, be not discoureaged. I conceive they merit a fair tryal. By all means keep your mind as easy & regular as possable. It is a well known fact that the mind has a happy influance on the body.

I expect to set out for Bethany on the twenty-fifth of this month; if you can spare me one of your small black horses to ride there, you will much obledge me. Riding my horse constently; his back continues sore. There is no huring on him. I am just about to set out for Milten this morning to try & bring that disagreeable business to a termination.[19] I am in hast adieu.

I am y[r] affectionate son,
JOHN JOHNSTON

NB. Let me know by the bearer, Mr. White, if you can spare the horse.

Two years later he wrote his father from Staunton as follows:

Dear Father,

I am happy to hear you are getting better. I have been indisposed since I returned from Richmond with a pain in my breast.

I have it now in my power to purchase either Mr. Sawyer's or Buchanan Plantations, if you could lend me one of the bonds of £500 I will repay you same as soon as possible. Your compliance will lay me under additional obligation.

Your affectionate son,
JOHN JOHNSTON

John lived 17 years longer, practised medicine, and accumulated cattle and property which later letters of his brothers record. He died on 8 April 1815 and was buried in the Johnston Cemetery at Salem.[20]

18 Andrew Moore's letter, Rockbridge Historical Society Library, Lexington, Virginia.
19 The "disagreeable business" had to do with a land grant.
20 His tombstone may still be seen.

Aphorisms of Avicenna*

A. SÜHEYL ÜNVER**

AVICENNA, son of the Orient, died in Hamadan 917 years ago (428 A.H.). It was to commemorate the millennium of the birth of this great genius that historians gathered in Iran in April, 1954. His philosophy and precepts of medicine, which so closely resemble our modern concepts, have formed the basis of teaching in Europe as well as in Asia over the centuries. The majority of civilized nations organized similar celebrations, and the admirers of Avicenna gathered in the four corners of the world to honor him and commune with his spirit.

All the known works of Avicenna, numbering some two hundred manuscripts, are to be found nearly complete in the various libraries of Istanbul and of other Turkish cities. It has happened that while working in these libraries we have often found in manuscripts signed by various authors and dealing with various topics, quotations and maxims attributed to the great genius whose memory has been so honored. We have translated these quotations and maxims, which are written in Persian and Arabic, and have gathered them under the title, "Aphorisms of Abu-Ali Sina," but unfortunately it was impossible to establish from Avicenna's works the various sources whence all these maxims originated. When unable to find the original texts, we compared them with the translations of Cherefeddin Yaltkaya and of Kilisli Rifat, which are to be found in the archives of our Institute of the History of Medicine.

In order that the commemoration of Avicenna's great genius not be limited to the days spent at Hamadan in April of 1954, some of the aphorisms of that unforgettable scholar, whose precepts have been the basis of teaching for centuries not only in the East but also in the West, are here presented. The aphorisms, some of which have been published already, can be a new source of inspiration for many. They express in timeless style the most

* Paper given in April 1954 in Iran at the Millennium of Avicenna.

** Director of the Institute of History of Medicine of the University of Istanbul.

profound and humanitarian sentiments. We can say that if humanity has a mouth, Avicenna is its tongue. With your permission here are presented some of his words.

On relations with fellowmen

You who ignore what fate prepares for you, may God stir you from your torpor and open your eyes. Learn that the wealth you amass is for others; only the blessings you give away belong truly to you.[1]

Be discreet toward all and know how to guard jealously your secret. If you succeed in keeping it well, it will be your slave; if you let it escape, it will enslave you.[2]

If one who has done you a wrong solicits your pardon, do not hesitate to forgive him.[3]

If one knows oneself, the opinions of others can have no importance nor have any effect upon one.[4]

If I leave no trace upon the heart of men, they will not be concerned with me; they will be neither for nor against me.[5]

If they look at me askance, I know that it is they who sleep until morning whilst I spend pure nights in the pursuit of science. If they look upon me unsympathetically, they will see nothing but evil in me, but if they look upon me with sympathy, they will see that the evil they imagined in me is in fact good.[6]

They cannot abide my being a physician of merit; it is painful to them to see my merits beside their ignorance. They believe they can hurt me with slander and calumny but their slanders and calumnies remind me of a goat who strikes the mountainside with his horns.[7]

The most profitable good deed is charity; the best character is that which bears all vexations without complaint. The worst deed is hypocrisy. The man who does not rise above the crowd cannot purify himself and remain without blemish [8]

1 Bibliothèque Köprülü. V. 1353. Bibl. Süleymaniye. Section Esad Efendi. N. 3396 "Enisül vahde ve Celilül Halve" of Ismail Hakkı.

2 Bibliothèque d'Ayasofya N.4829.

3 *Ibn Ebi Usaybia: Tabakatül Etibba,* the biography of Avicenna by his student, Ebu Ubeyd-Cüzecani.

4 Bibliothèque Chehid Ali Paşa N. 2703. Köprülü N. 483 and 1580 and Ahmed III N. 3303.

5 Bibliothèque de Ragıp Pacha No: 847.

6 *Ibid.*

7 See note 3.

8 *Ibid.*

Just as one eschews giving vent to a bad humour, so a person in high places should shun anger toward a humble person.[9]

Anger which dissipates itself quickly does not engender hate.[10]

On destiny

Do not struggle excessively for your existence; no one can assure himself a grain more than is destined for him.[11]

One dies and the only truth that matters is that one knows nothing.[12]

I have resolved all the problems that abound between the center of the earth and the stars. I have known how to untie every knot save the knot that binds us to death.[13]

One day I addressed myself in these terms to an experienced physician.

Why are my hair and my beard white?

Because of catarrh, he replied.

No, you are wrong, I said to him without embarrassment, it is because of grief.[14]

The white of my beard is a sign that announces old age and tells me that I do not have much time to devote to diversions and pleasures. I was advised to dye my beard; but although I do not like my white hair, I could not consent to this nor could I lie peacefully in my grave with such trickery.[15]

In the end, I have learned that we have neither learned nor understood anything.[16]

In aging, it is natural that one's hair and beard should grow white no matter what one may do—whether one removes the white hairs, covers one's head, shaves one's beard or dyes it—one can do nothing to stop old age.[17]

The world was made to be destroyed and strengthened to be shattered.[18]

9 Edviyei Kalbiye. Note on the manuscript of the Bibliothèque de l'Institute d'Histoire de la Médecine, Istanbul.

10 *Ibid.*

11 See note 3.

12 Bibliothèque Chehid Ali Pasha. N. 2703 and N. 2853.

13 Mecma-ül Fusaha. Bibliothèque de l'Institut d'Histoire de la Médecine, Istanbul.

14 Bibliothèque Süleymaniyé sect. Esat Efendi N.3500.

15 Bibliothèque d'Ayasofya N.4829.

16 Bibliothèque d'Ahmed III au Vieux-Serail. N.3303.

17 See note 3.

18 *Ibid.*

Man deceives himself with illusions but the days pass and time flies.[19]

Fortune is fickle; she knows neither law nor measure.[20]

On self determination

It is natural for those who set about a task thoughtlessly and without reflecting upon it to repent in advance for the consequence.[21]

An intelligent and ingenious man will not suffer in time of want; he will find the means with which to occupy himself agreeably and forget his hunger.[22]

In seeking success they have lost intelligence and understanding. Is what they have gained of the same value as that which they lost?[23]

You who live for merry-making and for pleasures hasten to learn that your existence depends upon a mere breath.[24]

Fate, that restive horse, is docile only with him who profits from experience.[25]

Each of us has the capacity to be merry or to be sorrowful, but some have a disposition toward nothing but joy or nothing but sadness.[26]

It is not those who have a sound spirit who rejoice the most, just as it is that those who rejoice do not have a sound spirit.[27]

On religion

It is not easy to believe that a person such as myself is an infidel; my faith in God is of the firmest. If I am thought an infidel, then there will never be a true Mahomedan on earth.[28]

God is the Alpha and the Omega. He manifests Himself everywhere and in everything.[29]

Man, who cannot remain eternally on this earth and who can-

19 *Ibid.*
20 *Ibid.*
21 *Ibid.*
22 *Ibid.*
23 *Ibid.*
24 Bibliothèque de Hamidyé. Section Lala N. 579.
25 Bibliothèque de Halet Efendi. N.773, Atif Ef. N. 2257, and Chehid Ali Pasha N. 2251.
26 See note 9.
27 *Ibid.*
28 See note 12.
29 See note 3.

not act as he thinks, must seek to rise above pettinesses and soar toward Heaven.[30]

The human soul is a lamp of which science is the flame and divine knowledge the oil.[31]

On envy

Often, for a word of no importance, for a mere trifle, we envy our neighbor and consider him a rival. We must be above these petty comparisons; we should ignore this sphere and rise above the crowd.[32]

I have never paid the slightest attention to those who envy me; I have never mentioned their names, while they have spent their whole life envying me.[33]

On Love

Oh my beloved, your beautiful eyes, that are the cause of my sickness, are also the remedy that can heal me.[34]

Nothing has been able to try the patience of my heart nor soften yours. Oh my beloved, we are two hard stones on the path of love.[35]

To feign for myself the return of night, I unbound your ebony hair but the brightness of your face dissipated my illusion.[36]

30 Bibliothèque d'Ayasofya N. 4829, p. 5, and N. 4849, P. 82.
31 See note 3.
32 See note 30.
33 See note 3.
34 See note 15.
35 *Ibid.*
36 See note 1.

The History of Sweat and the Sweat Rash From Earliest Times to the End of the 18th Century

E. T. RENBOURN*

Introduction

MEDICINE has not yet qualified as a science, and as an art it still obeys the dictates of fashion. In the attitude of clinicians and pathologists to the nature of the sweat rash or prickly heat, we have no exception; and during the last two thousand years fashions in etiology have come and gone.

Interest has recently been revived in this age-old disorder of hot climates and of profuse sweating, and the influx of large numbers of military personnel into the Middle and Far East during the Second World War gave opportunity for renewed observation[17, 62] and stimulated experimental studies.[54, 58] Nevertheless, controversies still rage as to its racial prevalence, nomenclature,[59] or morbid anatomy; the value of skin hygiene, the importance of water and salt intake,[29] and the etiological role of microorganisms[43a] or of fat content of the epidermis.[43b] It has even been suggested that the condition may represent a disturbance of adaptation to heat stress.[33]

Hidroa. The Travellers' Rash, or Sweat Pustules and Boa. Greek and Roman Periods

The ancient Egyptians were well aware of skin disorders and believed that most arose from dietary indiscretions or from eating sacred animals. Living in a fairly dry climate, with clothing both light and easily washable, and with a high level of personal hygiene enjoined by religious beliefs, they may perhaps not have been particularly afflicted by disorders of sweating. Furthermore, there appears to be no clear mention of a sweat rash in the various papyri which have been translated. Study of the Bible and of Assyrian and Babylonian writings also show no clear reference to such a condition.

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A high level of hygiene was equally common among the ancient Greeks, and like the Egyptians they were great believers in anointing the skin with oils and unguents. Hippocrates showed acquaintance with a number of skin afflictions but, as he gave little or no description, it is impossible to be certain of their nature, particularly as many names he used have frequently changed their meaning since classical periods. In the case of one skin affliction, however, there is much more certainty of its nature. This condition is mentioned in an Aphorism (Section 3: No. 21)[28a] which was to be constantly referred to by scholars during the next twenty centuries. The following is from the English translation of Adams:[28a] "Of summer, certain of these (diseases) and continued ardent and tertian fevers, and especially vomiting, diarrhoea, ophthalmia . . . and the sudamina"; and it is the word sudamina which opens up the long and varied history of the sweat rash or prickly heat.

Hippocrates wrote in Greek, and did not use the word sudamina (sudamen, singular)—an irregular derivative of the Latin, 'sudore,' to sweat. The original Greek expression used by him was ἱδρωα, from ἱδρως—sweat or gum—latinised and anglicised as 'idroa' or, more correctly, 'hidroa.' Throughout the centuries writers and commentators have incorrectly converted hidroa into hydroa (derived from the Greek ὑδωρ or ὑδρα 'hudor' or 'hydro,' meaning water), an error accentuated by the fact that sweat is but a variety of water. During the ensuing centuries hidroa of Hippocrates and other Greek writers was variously translated as sweats ('sudationes,' 'desudationes'), sweat papules ('papulae sudorum'), sudamina, and as heat spots. Derivatives of the words hidroa and hydroa are still in use today. Although Hippocrates wrote widely on the various forms of sweat occurring in disease, the only reference to hidroa is in the Aphorism given above. Apart from the fact that hidroa occurred in summer and was clearly related to sweat, it is not certain what Hippocrates had in mind; and we should, perhaps, also consider urticaria, insect bites, or other summer rashes, and perhaps even what are nowadays known as exanthemata.

In his 'Parts of Animals,' Aristotle put forward a theory that pituita or phlegm was formed by the condensing action of the cool brain on hot vapours passing into the head. On the matter of sweat he wrote thus:

The blood vessels get progressively smaller as they go on until their channel is too small for the blood to pass through. But although the blood cannot get through them, the residue of the fluid moisture, which we call sweat (ἱδρως) can do so, and this happens when the body is thoroughly heated and the blood vessels are open widely at their mouths.[4]

Theophrastus (370-297 B.C.) is best known for his book on Plants. He also wrote a few tracts of medical interest, among which is a little known ten-page document, 'On Sweat' (περι ἱδρωτον),[63] which can be regarded as one of the earliest expositions on the subject. Amongst other matters, Theophrastus commented on the change in sweating from childhood to old age. "Such variation," he said, "is due not only to the heat and humidity of the body's constitution, but also the open or closed state of the pores of the skin." "In the shade," he added, "sweating is greater than in the sun [a supposition perhaps copied from the 'Air, Waters and Places' of Hippocrates], because the sun dries up the sweat as well as blocks the pores." It would thus appear that Theophrastus was conversant with the doctrine of 'Strictum et Laxum' of the pores (Methodism or Solidism) as a cause of health and disease. He also described a disturbance of sweating, as follows:

Working and moving about, and when in a state of plethora, produces a rash which the Greeks call 'Enodioi' (ενοδιοι); it breaks out in travellers especially on the limbs and sometimes on other places . . . exertion makes it worse as shown by an inflammation . . . but if left alone it quickly disappears. Scratching produces a bad quality of sweat and is followed by a profuse rash. Wherefore it is advisable not to throw it in by irritating liquids—acid, acrid or salty—nor to administer hot or cold baths, but simply to apply tepid applications.[63]

In the 'travellers' rash' we have, perhaps, the first description of the sweat rash or prickly heat. It does not appear that Theophrastus used the expression hidroa.

Skin disorders are found in the 5th Book of the *De medicina* of Celsus, but with little more description than found in Hippocrates. The following is from the discourse on pustules:

Pustules arise chiefly in the spring; there are many kinds. For at times a sort of roughness (aspredo) comes all over the body, or a part of it, resembling the pustules which are set up by nettles or sweating (pustulae ex sudores); exanthemata the Greeks call them. At times they are red, at times no redder than the colour of the skin. Sometimes a number occur resembling pimples, sometimes the pustules are larger livid or pallid or black. . . . The worst kind of pustule is that called epinyctis.[13a]

Celsus, and later writers, used the word pustule to mean almost any elevation of the skin, and 'pustulae siccae'—dry pustules—

would correspond to what nowadays are called papules. Celsus also wrote on 'papules,' but these appear to correspond to the 'lichen' of Hippocrates. It is fairly clear that, in the above passage, Celsus was considering a number of skin disorders, and sweat pustules are mentioned by name only. Although he wrote in Latin, Celsus frequently used Greek expressions. Thus, 'epinyctis' was a pimple or rash appearing, or aggravated, at night. Although well aware of his predecessors, Celsus referred neither to the hidroa of Hippocrates nor to the 'traveller's rash' of Theophrastus. He did, however, use the word hidros; but not in the sense of sweat. Thus he continued:

> Again the Greeks distinguished, by name, different kinds of sanies and pus. For there is a kind of sanies named either hidros (ἱδρως) or melitura (like honey). Hidros is thin, whitish and comes from ulceration.[13b]

It has been noted that, on occasion, hidros was used to mean a gummy substance, and this was, perhaps, the sense in which it was used by Celsus. However, some translators[13c] insisted that, in the early editions of Celsus, 'hidros' was not used but, instead, 'ichor' (ιχωρ) meaning a thin discharge.

Pliny's description of the origin of sweat *(Natural History,* Book XI) is worthy of notice but was probably copied from Aristotle.

> The veins which are dispersed beneath the skin in filaments of extreme thinness, terminate in such remarkable fineness that the blood is able to penetrate no further except as an extremely subtle humour which oozes from the skin in innumerable drops, and is known to us as sweat (sudor).[49a]

In the 23d Book, Pliny mentioned the cure of sweat papules (papulae sudores),[49b] a condition, no doubt, identical with the sweat pustules of Celsus, the traveller's rash of Theophrastus, and the hidroa of Hippocrates. Physicians of the seventeenth century and later often claimed that the word sudamina was used by the Romans, but it is to be found neither in the *De medicina* of Celsus nor in the *Natural History* of Pliny. Pliny gives the earliest reference to a skin disorder known as 'boa' or 'bova,' perhaps so called because of its cure by hot ox dung. Boa was to become 'bothor,' a term used, on occasion, by the Arabs and later physicians to mean, amongst other things, the sweat rash.

> Morbid or pituitous eruptions [said Pliny] are cured by Plantago or the root of Cyclamen mixed with honey. Leaves of the Ebulum bruised in old wine, and applied locally, are curative of the condition called Boa which appears in the form of red pimples.[49c]

In the book on 'Hygiene', Galen wrote of one Premigenes, "hot and dry in disposition," whose skin was "acrid and bitter . . . and too thick to permit elimination of fuliginous vapours," and who "on omission of a single bath . . . developed a fever."[23a] We have here, possibly, an early example of constitutional anhidrosis.

> Sweat [continued Galen] is one of the fluids formed in the animal body consisting of the same material and having the same mode of formation, as the urine, for both are formed from the liquid drunk, these being heated and acquiring also a bilious property. But the sweat is more elaborate having passed through so many intervening bodies in its passage to the skin.[23b]

According to the Galenic teachings, the stools were derived from the first or gastric, and the urine from the second or hepatic concoction (digestion); but tears and sweat come from the most elaborate of all—the third or final concoction. Galen was not clear as to how sweat came out of the skin. Sometimes he put forward the obvious and common sense view that it came through the skin pores as small drops of liquid. On other occasions he followed the idea of Aristotle and insisted that sweat arose from the invisible transpiration or insensible perspiration — αδηλος διαπνοη,[23c] adelos diapnoe—through the condensing effect of a cold air. This is the probable origin of the 'dew' theory of sweat formation. Arguments on this dual origin of sweat were to continue to almost the end of the nineteenth century. The Greeks also believed that fluids could get into the body as easy as sweat passed out, and this may have been the explanation of the use of nutrient baths of milk or soup when food could not be swallowed.

In his commentary on the Hippocratic Aphorism on summer diseases, Galen said as follows: "Hidroa (ἱδρωα) is a type of exanthem which, as the name implies, arises from profuse sweats of a bilious or biting character, and breaks out on the surface of the skin, exasperating it like ulcers."[23d] Although this description of the sweat rash was less complete than that of Theophrastus, it was to be copied from book to book for another sixteen centuries or more. Galen frequently referred to obstruction at the skin pores, by either sweat or insensible perspiration, as a cause of disease, but nowhere does he state that such obstruction was the cause of hidroa.

Galen wrote in Greek and did not, of course, use the word sudamina. This, however, is the translation of 'hidroa' used by Kühn[23d] in the Latin version of the Galenic works. The Greek writer, Pollux (circa 2d century A.D.), mentioned the 'hidroa

rash' (ἱδρωα εξανθηματα) in his dictionary,[50] but the condition does not appear to be referred to by two other Greek writers of this period—Aretaeus (*ca.* 2-3d Century A.D.)[3] and Caelius Aurelianus (*ca.* 4th Century A.D.)[6]—nor does the word sudamina appear in the early Latin translations of their works.

Sweat Papules, Essera and Bothor

Aetius (6th century A.D.) was born in Amida or Diabekr, a remote town of Byzantium where, said Robert Burton, "'tis so hot there in some places that men of the country and cattle are killed with it." In the 'Tetrabiblion', Aetius wrote that: "The pustules of Psydracia of the Greeks are also called sweat papules or aborted sweat (papules ex sudores aut sudores abortus)."[2] Since, however, the above is from a Latin translation and the 'Tetrabiblion' was written in Greek, neither 'papulas ex sudores' nor sudamina could have appeared in the original. Nevertheless, Aetius may have suspected that the sweat rash arose from obstruction to the exit of sweat. The expression sudamina cannot be found in either the Latin or early English translations of the works of the Byzantine physicians Oribasius and Paul of Aegina.

In a Latin translation of the Canon (1556), 4th Book, Avicenna has two passages worthy of notice. In the first of these it is noted that: "The Essera (Ash-Shāra) is a little pustule, like a small blister, . . . and the cause of it is a hot vapour raised suddenly in the body, from either choleric blood or a nitrous humour."[7a] 'Essera' (a contagious disease, a pimple) and related Arabic terms were to be accepted by later writers as the equivalent of papules, urticaria, and exanthemata, but often identified with the sweat rash. Avicenna added that the 'essera' was sometimes associated with a Tertian fever, thus, perhaps, corresponding to the 'Febris Esserosa' of later writers. The second passage is of greater interest. Writing on the 'bothor' ('boa' of Pliny) he said:

> Whosoever sweats profusely (desudationes), but with good digestion, may be affected in the cool of the night with obstruction of the pores of the skin, resulting in an itchy roughness and the papules of the small Bothor, also called 'daughters of the night' (benat alleili; planta noctis; epinyctis). The cause of it is insufficient relaxation of the skin, increased by the condensing action of the cool night air when digestion is most active and, when, therefore, transpiration should be most copious. In this disorder itching is most violent. At first, scratching gives a feeling of gratification, but this is soon replaced by severe discomfort in the parts affected.[7b]

Elsewhere in the Canon, Avicenna wrote on 'hasef,' the 'prickly bothor' ('bothor spinosi'), and 'sudamina' as more or less synonymous. It may be, therefore, that he had the latter disorder in mind when he spoke of the 'small bothor.' The Greeks, on whom many of Avicenna's ideas were based, sometimes believed that fevers and other diseases arose from blocking of the 'pores' of the body. One cannot, therefore, assume that Avicenna ascribed the sweat rash specifically to such a cause. The word 'sudamina' was, undoubtedly, unknown to Avicenna, but was used fairly widely by the time of the 1556 translation of the Canon. Avicenna wrote also on the 'large bothor,' the 'red' and 'white bothor' ("like drops of milk") and bothor of the stomach, lungs, and elsewhere.[7e] By the general appellation 'bothor,' the Arab physicians, however, included measles and smallpox.

The name Actuarius was used for a number of physicians attached to the court at Constantinople. One of these, John (son of Zacharias) Actuarius, who lived sometime during the eleventh to the thirteenth centuries, was regarded as the last of this line. He is mentioned several times by Robert Burton in the *Anatomy of Melancholy*. Actuarius is best known for his writings on urine, and for the introduction of a graduated urine glass; but as a writer on skin diseases he is less well known although periodically referred to by medical writers of the sixteenth and seventeenth centuries. The following passage is from his discourse on 'hidroa': "By some people such sweats are called ἰδρωα, and, by ourselves, they are known as sudamina. Of a benign character they are created by humours coming out into the skin." This, at first glance, appears to be another early reference to the word sudamina. However, the above passage is not from the original Greek but from a Latin translation also published in 1556. One cannot ascribe the early use of sudamina to Actuarius: neither has the expression been found in a perusal of the Latin works of the medieval writers—Lanfranc,[34] Mondeville,[41] John of Gaddesden,[22] and Guy de Chauliac.[24] Mondeville copied Avicenna's description of the 'desudationes' or 'planta noctis' almost verbatim, but ascribed it to obstructed sweat rather than to obstructed transpiration. Guy de Chauliac[24] grouped together 'variolis,' 'morbillis,' "desudationes,' 'essera,' and 'planta noctis' as little buttons on the skin arising from scratching when in a sweat or when overheated.

Hidroa of Hippocrates had, from the outset, been translated as either sweats, profuse sweats, or as a rash associated with such

sweats. Perhaps the resemblance between the clear superficial vesicles of hidroa and the fine droplets of a critical sweat may have led to confusion. This may possibly explain 'desudationes' (profuse sweats: Greek, ephidrosis), a term often used by medieval Latin writers as a synonym for hidroa or sweat papules. 'Desudationes' was probably the precursor of 'sudamina.'

In the fifteenth century, Leonardo da Vinci, writing on the nature of water, noted that: ". . . from the fact that when water evaporates the original quantity of salt remains, there must needs pass through human bodies as urine or sweat or other excretions that are found there, as much salt as is brought every year into the cities."[35]

Miliaria, Herpes, and Formica. Early History

The word miliaria is so closely bound up with the history of prickly heat that it would be well to consider it at the present stage. Miliaria is derived from the Latin 'milium' or 'miliarus,' meaning millet, the small seeds of which have been used since time immemorial, particularly in the East and countries around the Mediterranean basin, for food and other purposes. The Greeks used 'kenchros' (κεγχρος) to mean either millet or its grains, or anything of a similar size. Thus it was also used to mean the eyelet holes in the rim of a shield through which the soldier could with safety watch the enemy. Galen likened the size of the developing heart to that of a millet seed, or, he added, "if you will, a bean."

Hippocrates advised the use of millet in milk for stomach complaints. Pliny mentioned a species of sweet millet bread; but Celsus, Galen, Paul of Aegina,[44] and the Arab physicians regarded millet as an inferior food (which blocked the 'pores' and bound the belly) and suitable only for fomentations and the like.

The earliest reference to a miliary condition of the skin, presumably any rash of papules or vesicles the size of millet seeds, is found in the Hippocratic works. The 'Prognostics' mentions 'hidrotes kenchroides' (ἱδρωτες κεγχροεδεες),[28b] variously translated as 'miliary sweats' (Littré) or as a 'miliary eruption' (Adams). Elsewhere (Epidemics) Hippocrates mentiones 'trechismata kenchroidea'—τρηχισματα κεγχροδια—Latin, aspredo miliacea,[28a] a miliary roughness, or a miliary rash, occurring during a febrile illness. Celsus himself likened 'sweat pustules' to a roughness of the skin.

The word miliaria was used by Galen and later writers in reference to a variety of herpes—a condition, itself, somewhat obscure. Paul of Aegina write on the matter as follows:

> When yellow bile mixed with any humour is fixed in a part, the affection is called herpes . . . but if it is thin, less acrid and hot, it raises small blisters on the surface of the skin like millet seeds and hence has been called herpes miliaris. According to Oribasius a mixture of phlegm and yellow bile produces herpes miliaris.[44]

Examinations of the writings of the Arab physicians also show a number of references to a miliary rash. Haly Abbas in the 'King's Book' wrote on smallpox and measles and said they were sometimes associated with a miliary rash. In the 'Canon,' Avicenna noted that:

> The miliaria (Arabic, karvarsija; from kavars, millet seed) are similar to the formica in cure, and sometimes the formicas are bad fevers of a miliary variety and pernicious when the patient is overheated. And pestilences sometimes arise from such a cause.[7a]

The word 'formica' (Latin—an ant) was used loosely by medieval and later writers to mean any disorder, with or without a rash, where the presenting symptom resembled the biting of an ant. Although such a symptom is somewhat characteristic of the sweat rash (or 'bothor spinosi'), close examination of the early literature suggests that 'formica' often represented the nervous manifestations of ergotism ('ignis sacer'), pellagra, leprosy, syphilis, and other disorders. Lanfranc, renowned surgeon of Milan in the twelfth century, wrote on the matter:

> Fformica is a pustula that . . . cometh of colre brent . . . miliaris hath litel pustulis and hath not so greet a brennyng, and the place thereof is not so reed. . . . Pustules that cometh of humours corrupt as ignis persicus, miliaris and fformica shall be purged with medicynes that purge coler and malancholie.[34]

John of Gaddesden (1280-1360 A.D.), contemporary of Chaucer, may have been the "very parfit practisour" of the Canterbury Tales. He commented thus on formica:

> From thin choler, the apostume formica corrosiva [perhaps lupus vulgaris] is formed; from thinner choler that called formica miliaris, the which is more in the flesh than in the skin, and is like a big ant. . . . Of the imposthumes formed of phlegm, some are made of thin phlegm along with a little choler; of such are the pimples that grow in the night, and they are called 'daughters of the night.'[22]

Apart from the fact that miliaria was applied to any finely granular rash, it is perhaps unwise to attempt accurate diagnosis

of any of the miliary rashes mentioned above. Nevertheless, up to late in the nineteenth century, miliaria, or herpes miliaris, was used periodically to designate the sweat rash. The expression miliary tubercle was coined by Bonetus in the seventeenth century, and the use of 'milium' is ascribed to Plenck (1776).

Hidroa, Sudamina, and Miliaria. 16th Century

During the sixteenth century printing was becoming widespread, and the works of the classical authors came into the hands of European physicians. Errors must have occurred not only in the copying of the early manuscript, but also during the printing of Greek originals and the Latin translations. Furthermore, certain Greek words such as hidroa defied accurate transcription. In an early printed Latin translation of the Hippocratic works by Fabius Calvus (1525),[28g] hidroa was translated, not as sudamina but, as 'sudores' or sweats. An early use of the expression sudamina is found in the original Latin text of Giovanni Manardi (1521).[37] Referring to Galen's commentary on hidroa, he said the disorder was the same as 'epinyctis' of the Greeks, the 'desudationes' or sudamina of the Romans, and similar to 'bothor pustulis' and the 'essere,' 'sere' or 'saire' of the Arabs.

The following passage is from the *Universa medicina* of Jean Fernel (1542):

> The small and watery pustules are the ἱδρωα or sweat rash (id est sudationes). Of the size of a millet seed, and full of water, they break out suddenly all over the body, but particularly on the hands and feet, and are without redness and without pain. They are created by sweat collected under the epidermis, through the pores of which it cannot pass; for which reason they are called sweat papules. (Fiunt enim ex sudoribus sub epidermide coërcitis, per cuius spiracula iidigeri minime possunt: unde a quibasdam sudorum papulae nuncûpantur). The Ephelides are somewhat larger.[19]

We may assume with fair certainty that Fernel was describing the sweat rash; but it is strange, perhaps, that he should stress the occurrence in an unusual site—the hands and feet. Possibly there was in his mind confusion with scabies and what is now called dysidrosis. Although Fernel noted that hidroa arose from blocking of the sweat pores, Avicenna, and Aetius before him, may have suspected the same. However, from the time of Galen onwards, most diseases of the flesh had been ascribed to such a cause. The word sudamina was probably in wide use by the early part of the

sixteenth century, but it has not been found in the *Universa medicina.*

There is no mention of sweat papules, sudamina or a miliary rash in either the *Breviarie of Helthe* of Andrew Boorde (1547)[10] or the *Boke of Childern* of Thomas Phaer (1560),[45] but the following is found in the contemporary 'De contagione' of Fracastorius:

When it [the skin] is not in an inflamed condition, but still heated, so that it, so to speak, boils, it causes what are called exanthemata. Pliny calls these papulae, and they are vulgarly called the heat rash ('suffersurae', Latin; to heat from beneath), I suppose because of the fervid heat. They are pustules which are raised above the skin, are red, and run into one another, occurring chiefly in children who are overheated. There are two kinds of them . . . one drier and redder, which Avicenna calls 'planta noctis,' the other of a paler red and due to thin pituita in the blood. These the Greeks call ἰδρωα; we know them as sudamina; Avicenna called them 'desudationes.' . . .[21]

Variola and Morbilli . . . are scattered red spots which grow more plainly into pustules; sometimes they are moist pimples, but if drier they resemble the heat rash in children commonly called suffersurae.[21]

Johannes Philip Ingrassia was born in Palermo, Italy, at the commencement of the sixteenth century. He graduated in 1537 and rapidly made a great reputation for himself both as an anatomist and as a clinician. Like Galen, and many others, he described skin disorders under the heading of preternatural tumours ('tumores praeter naturam').

The Bothor [wrote Ingrassia in 1554][31] are also called in Latin pustules or raised spots. The commonest form, which may simply be called an apostume or perhaps a large Bothor, is either of a hot or a cold variety. . . . However, there are also spots called Sudamina and in Greek Hydroa, a sort of exanthem which irritates the skin like ulcers and arises on account of profuse sweats in a bilious constitution. We say they are correctly called ἱδρωα by Hippocrates and Galen, and incorrectly as papulae sudorum by Pliny in contrast with the expression sweat rash (exanthemata sudorum). However, Razes and even Avicenna call it Asef, or, with the article Alasef, Alhasef, or even Asafate. Hali Abbas wrote, similarly, Asefa or Asafa. This confirms that what was formerly known as Sahafati is derived from Asef or Asaf—which itself simply means sweat. . . . In Sicily we commonly call this sort of affection Bruxoli or Brusoli which comes out on the skin like a burning. In the vernacular the Italians call it Cocturas, as if made in the heat of coction. The disorder is best known in boys and youths especially in those of a hot temperament; and it lasts for a particularly long time in the summer. Most people get it on the neck, arms and chest, but in women it may cover the body. Very often it appears like the prickly Bothor. At the onset the spots are the size of millet grains, and hence the people of Naples call it Migliarino, Miliarinu or the Miliaria.[31]

Here is the most complete description of the sweat rash to be written up to the end of the sixteenth century. There are, however, several points worthy of consideration before we pass on. Ingrassia used the incorrect hydroa—ὑδρωα—perhaps an oversight for the 'Sicilian Hippocrates.' It is not clear what he meant by large 'bothor,' but it is obvious that sudamina, 'asef,' 'bruxoli,' 'cocturas,' 'prickly bothor,' and miliaria refer to one and the same disorder—the sweat rash. The significance of bruxoli or brusoli appears, at first sight, obscure, but a remark in Vigo's 'Surgery' of 1514[67] may clarify the matter. Writing of the 'French Pox' epidemic of 1484, he noted that the Lombards called it "Le Malo de la Brosule' and added: "Every people give it whatsoever name they like, but after all such names make very little difference."[67] 'Bruxoli' and 'brusoli' appear related to 'broscia' or 'broggia,' and derived from the old Italian 'broz' meaning a seed, boil, or pustule. Vigo also noted that 'sa'afa' or 'sahafati' of the Arabs was a delicate rash occurring in the French Pox. Later, Piso (1648) was to identify sa'afa with the 'boubas' or yaws of Brazil. There is little doubt that, from earliest times, sudamina was confused with the syphilitic rash. This may perhaps explain why the word 'crystalline' was sometimes applied to both conditions. Ingrassia used it in reference to the clear vesicles of chickenpox. In the next century 'crystalline' was to be applied to the miliary rash.

The *De morbis cutaneis* (1572) of Gerolamo Mercurialis[39] may be regarded as one of the earliest systematic treatises on skin disease, and the book on 'Excretions' gave a chapter of some twenty pages devoted to the subject of sweat. Both Mercurialis and Anutio Faesio ('Hippocratic Dictionary' of 1588) frequently referred to the 'Liber de sudoribus' of Theophrastus, but wrote little on sudamina or hidroa which cannot be found in earlier writings.

The Dutch physician, Peter Forest (1591),[20] was well aware of the writings of Fernel and Ingrassia on the sweat rash. Discussing 'boa' of Pliny, the 'bothor' of the Arabs, he said this was the rash which in 1556 occurred in lying-in women and which the people of Holland called variously 'boothon,' 'rothont,' or 'rootvonck.' We may here have a clue to the origin of 'rote hund' or 'roode hond,' present-day German and Dutch expressions for the sweat rash, and for 'roodvonk' used at the present time, in Holland, to mean scarlet fever. This matter will be taken up later.

At the end of the sixteenth century a pamphlet was written by George Wateson or Whetsone, an Elizabethan poet and gallant, who accompanied Humphrey Gilbert on several voyages.

The Espinlas [said Wateson], is a very strange sickness, and usual in those such as take cold in their breasts after great heat or travell. And most times it comes to those that lye with their breasts upon the ground especially in the night. The partie having the Espinlas will be giddie in the head, and will have pains and pricking at his breast, as with many thorns, wherefore I thinke it is so called of Spina and Espina, the Latine and the Spanish words for a thorne.[68]

For treatment he advised enunction with olive oil.

Singer (1915)[68] accepts the above as a description of prickly heat. Although it is clear that Wateson wrote on tropical disorders, he nowhere mentions that the 'espinlas prickings' was in any way connected with sweating or, indeed, that the condition was a skin disorder. Closer reading of the clinical features of the 'espinlas' suggests it probably has the same significance as the formica already described.

This brings to an end the first twenty centuries of the oldest recorded skin disorder, the hidroa of Hippocrates. Although hidroa was on occasion used to mean sweat and sometimes confused with other skin disorders, its identity was from the outset fairly clear. The first use of sudamina has not been discovered, but the word appears to be a medieval expression not used by physicians before the sixteenth century.

HAFENREFFER, SENNERT, ZACUTUS, AND BONTIUS. MILIARY GLANDULES

The 'Nosodochium cutis' of Samuel Hafenreffer (1630)[25] is well worthy of perusal, not only as an early textbook of dermatology but also because of the numerous references to German expressions of the time. Phlyctenae (Greek, blisters) were, he said, watery pustules like clear blisters which the Germans called heat spots ('hitzigeblattern'), 'wild fire' ('wild fewr'), 'springing fire' (springende fewr'), or 'dog blisters' ('hundtsblattern'). 'Hitzigeblattern' is an expression still used in Germany to mean either heat spots, the sweat rash, or eczema vesicles. 'Wild Fire' may have been the 'ignis' of the early writers, and 'springing fire' may be the same as 'formica.' As for 'dog blisters' (an expression used earlier by Felix Plater, 1603)[47] the meaning is obscure, but the word 'dog' may refer to the heat of the 'dog days' ('hundstaghitze). Hafenreffer used hidroa or the incorrect hydroa indiscriminately. This condition was, he said, the same as 'sudalia' or sudamina which the Germans called 'sweat blisters' ('schweissblaterlin'), 'wifelsucht,' or schwülen, a condition occurring in

"bodies of a hot and moist constitution, particularly in certain years and certain days, and after immoderate exercise beneath the sun or in a hot wind." 'Schweissblaterlin' is another German expression still used to mean the sweat rash, but the meaning of the other two words is not clear. 'Boa' was the red pimply rash of Pliny; as for 'bothor,' this was sometimes used by the Arabs to mean measles or smallpox, and was known to the Germans simply as 'blattern.' Hafenreffer did not, however, use the 'roothont' or 'rootvonck' of Peter Forest.

In his 'Practical Medicine' of 1634 Daniel Sennert[57] wrote a chapter on 'Sudamina and Sirones.' The description of sudamina was, in the main, but a rehash of that of Ingrassia, but Sennert stressed that the condition was common during hot damp summers (especially in those overdressed or wearing filthy clothing) and in humid, ill-ventilated places. Sirones or ('chirones'), which was dealt with separately, was clearly nothing but the itch or scabies. Essera was a class of tumour not met with in Greek or Latin works, and, said he, in Germany was frequently called Sore or Sara:

> . . . like little tubercles red and hard, which break out all over the body with an acute itching like the sting of bees, wasps or gnats or like being beaten with nettles. After a time they disappear . . . and the skin recovers. Some people place it among the Epinyctis of the Greeks . . . but truly they are not well advised since Essere rarely breaks out at night. . . . Sometimes it is antecedent to a Bilious Fever.[57]

Sennert may have had urticaria or other skin disorders in mind when he spoke of 'essera,' but earlier and later writers accepted it as the same as the sweat rash. Hippocrates wrote on fevers associated with a miliary rash, and Avicenna had noted that 'essera' could occur with a 'tertian fever.' Writing on the matter, Zacutus (1637) said: "On Esserosa Fever. The Sudaminal Fever had nothing in common with Variola. The spots which the Greeks call Epinyctis (as in Celsus), the Arabs call Essere (Sere, Saire), Galen called them sweats or Sudamina."[70] Galen, however, wrote in Greek, and the medieval Latin expression sudamina did not appear in the medical literature until the beginning of the sixteenth century. For treatment of the 'sudaminal fever' Zacutus advised covering the patient with red cloth, suggesting that he had, in fact, confused the condition with variola; for such was the treatment used from Arabic times onwards to prevent pitting of the skin.

Jacob Bontius,[9] physician to the Dutch settlement in Java, wrote an early text on tropical diseases. It is clear that he had experience with the disorders he wrote about. His 'Indian impe-

tigo' or 'cowrap' arose from "a salt and nitrous pituite mixt with Bile and melancholic Humours." It was probably a fungus disorder. On the sweat rash Bontius added:

> These eruptions which Cornelius Celsus the Latin Hippocrates called Papulae, Pliny Sudamina, and which the People of Holland know as Rootvont, are so common in this Country that I never knew one person who escaped them, no more than the Bite of the Fleas which the Portugese call Mosquitas. The Pimples are of red colour, somewhat rough, and thrown up on the skin by a Sweat. They infest the whole exterior of the Body from Top to Toe with great and irresistible itching. People newly come from the country are more affected with the Eruption as well as the Bites of the Musquetoes than those who have lived in it some time; so it is common jest here, to say by way of ridicule, that he who has the eruptions is Orang Baru, meaning a novice, and therefore that Fleas and Papulae claim a tribute of Milk and Butter from having seized him; for those who have been longer in the country call themselves boastfully Orang Lamme, or veterans. . . . This troublesome complaint, as far as it is an Eruption, is to be ranked amongst the cutaneous Diseases; but if treated rashly or the Skin be wounded by the Nails, the Wheals and likewise the Bites of the Musquetoes, often produce foul Ulcers, which are malignant and difficult to cure.[9]

For treatment Bontius advised "a mixture of Vinegar and Water, with the addition of Nitre and Salt Pruriel." He strongly enjoined physicians not to drive the "rash inwardly," for this would lead to fever or serious complications elsewhere. This fear of a disappearing sweat rash was to continue for at least another two centuries. We may here take note of the word 'rootvont' used by Bontius to mean the sweat rash. A similar expression was mentioned by Guglielmo Piso (1648),[46] another Dutch physician. Writing of the disease of Brazil he referred to "the papules or sudamina commonly known as 'roothont.' There seems little doubt that 'boothon,' 'rothon,' 'roothont,' or 'rootvonk' are variants of 'bothor,' an expression used, some five hundred years earlier, by the Arabs, to mean pimples, the sweat rash, measles, or smallpox. Here we may have the origin of 'rote hund' and 'roode hond' (red dog) used nowadays by the Germans and Dutch to mean the sweat rash, and of 'roodvonk,' the common expression (Dutch) signifying scarlet fever. However, 'roode hond' is sometimes used to signify German measles and this is the common present-day meaning of the Danish and Swedish 'Røde Hunde' and 'Röda Hund.' The prefix 'red' (of 'roothont') may refer to the colour of the sweat rash papules. Another possible significance of 'dog' has already been mentioned.

In 1665 an epidemic of an apparently new disease appeared in Leipzig. One of its most characteristic features was profuse

sweating followed by the appearance of a finely granular rash of papules and vesicles. From this time onwards the word miliaria was used, in general, to mean not the hidroa or sudamina of earlier writers, but the rash of the new disease—'miliary fever,' 'suette miliare,' or 'Schweissfriesel.' Many clinicians were, from the outset, suspicious that the miliary rash was nothing but the age-old sudamina in disguise; the profuse sweats being due, not to a hot, humid climate, but to a similar condition under the bedclothes arising from the 'Hot or Netherland Regime'—the combination of external or internal remedies of a heating nature capable of opening the supposedly closed pores of the skin.

Not only was sudamina confused with the rash of 'miliary fever,' but from earliest times, it had been confused with the exanthemata. Although Rhazes had distinguished smallpox from measles, and Ingrassia had separated 'rossania' (measles) from 'rossalia' (scarlatina), confusion persisted. In his household dictionary of 1671, William Salmon noted that: "Ηιδρωα, sudamina, the measles, are pustules like little millet seeds which ulcerate the skin, affecting generally children; they come from cholerick matter restrained."[55] The spelling of the Greek 'hidroa' is unusual but may represent a printing error.

During the seventeenth century, descriptions of sweat had an interesting iatrochemical flavour. Thus John Mayow wrote (1674):[38] "The reason why the sweat is so acidosaline, seems to be that the volatile spirits of the Blood, intimately combined with sulphureous particles, are brought to a liquid state by the effervescence which takes place in muscular contraction." Writing on the same matter in 1684, Stephen Blancard commented: "Sweat is a humour which consists of water chiefly, with a moderate quantity of salt and sulphur. This is driven through the pores of the skin by the heat and fermentation of the blood, and sometimes by its weakness and colliquation."[8]

From the time of the ancient Greeks, pores were believed to exist in the skin (and internal organs), but nothing was known of what lay behind them until Steno in 1664[61] described the 'fontes sudores' or sweat glands through which, said he, both insensible perspiration and sweat passed out. Malpighi, five years later,[36] described the ducts of the 'glandulae sudores,' and noted that they were similar to those of the salivary glands. In 1665 Bellini observed that the sweat glands were simply a conglomeration of blood vessels. Ruysch, who wrote similarly, demonstrated

by his injection technique that the conglomerations terminated in the 'perspiring' or 'exhaling' arteries of the skin, through the walls of which sweat and insensible perspiration oozed out. In 1685 Robert Boyle said: " . . . the skin being full of pores and these being of different sizes and figures . . . the air . . . gets entrance at some of the numerous orifices of the minute or miliary glandules of the skin or at some other pores of it".[11]

It was said by some that the two excretions of the skin came out by separate vessels. Others believed that sensible liquid sweat passed through 'perspiratory' vessels or arteries, whereas the insensible 'matter of perspiration' oozed out of easily compressible 'nervous tubuli' or 'perspiratory ducts.' This perhaps gave basis to the doctrine (of Sanctorius) that when sweat was profuse, passage of insensible perspiration was correspondingly hindered.[52] Some even described valves on the vessels, ducts, 'tubuli,' or pores, capable of obstructing the cutaneous excretions. However, there was to be little factual knowledge of the nature of the miliary glands or their ducts for more than a century and a half. No mention has been found in the literature of sudamina arising from disturbed action of the valves.

SWEAT, ECHAUBOULLURE, AND PRICKLY HEAT. FIRST HALF EIGHTEENTH CENTURY

In 1714 Daniel Turner demonstrated by a simple experiment the existence of the skin pores:

> For [said he], if one will with an indifferent Glass survey the Palm of his Hand very well washed . . . Ridges will be seen . . . and upon these stand the Pores. . . . Each Pore looks like a little fountain, and the Sweat may be seen to stand therein as clear as Rock Water, and as often as it is wiped off, to spring up within them again. . . . These Pores are very convenient to open Passage for the Discharge of the more noxious perspiratory Parts of the Blood, which by the continued use of the Hands and Feet are plentifully brought into them.[65]

On the eruptions in children—"Psydracia, Phlyctenae, and Sudamina"—he added:

> By the third (Sudamina) are small Pimples of the Bigness of a Millet Seed, exulcerating and fretting the outward Skin. This . . . is an Eruption chiefly affecting Infants and Young Persons of a hot Constitution in the Summer Season, appearing about the Neck, Shoulders, Breasts, Arms and Thighs, but frequently on the Arms and Pudenda.[65]

Authentic accounts of the condition had been written by physicians (viz. Bontius) practising in hot damp climates. Richard

Towne (1726)[64] of Barbados must have had abundant experience with tropical skin disorders. Like Bontius he distinguished the sweat rash from ringworm but realised the conditions could co-exist. In the chapter on "The Sudamina and Ringworms" he wrote:

> It is very usual for People on their first arrival to be molested with a troublesome and uneasy Itching all over the surface of the Body which breaks out in little, reddish, bladdery Pustules, principally upon the Breast. This Pruritis exasperates the Patient to so great a Degree that human Resolution is not able to restrain him from scratching, upon which a sharp bilious salt Humour oozes out of so corrosive a Nature that it often frets and exulcerates the outward Skin, leaving the Breast exceedingly sore and raw. Altho' the Disease be greatly vexatious yet the Cure should not be rashly attempted by Astringents or repelling Applications, for upon the drying up of the Humour, several people have been seized with a Fever, Dropsy or a dangerous Dysentery. . . .[64]

As treatment, Towne advised "cooling purges with Manna, Crem. Tartar and such like, but . . . in a hot Constitution Blood letting might be the first thing attempted." With Fernel he suspected that block of the skin pores was the cause of sudamina, for:

> When the bilious Matter which ought to be discharged by the Eruption is detained by the sudoriferous Glands by means of Cold, the thinner and more subtle Part of the cutaneous Secretions passes off by Insensible Perspiration; and the Salts, being deprived of a Vehicle, are too gross to escape thro' the Pores of the Skin, and are lodged in the Glands where they acquire a corrosive pungency. . . . For this Reason the Disease is changed into one more obstinately cutaneous, which puts on the appearance of an Impetigo, commonly called in these parts Ring Worms, and often persists a long time with a violent Herpes Exedens.[64]

The 'ring worms' are undoubtedly the same as the 'Indian Impetigo' of Bontius. Sauvages (1734)[56] placed hidroa in the second of his five 'Orders' of skin diseases, together with herpes, 'epinyctis,' and 'psydracia.' As synonyms of hidroa he gave 'alasef' and the French expression 'echauboullure'—traceable to the sixteenth century but a term still used to mean the sweat rash.

About this time another synonym for the sweat rash appeared in the literature. An Englishman, John Mitchell, practising in Urbana, Virginia, wrote a long essay on the colour of negro skin (1744).[40]

> Negroes [he said] are never subject to be sun-burnt, or have their Skins blistered by any such degree of Heat, as Whites are; but if we consider that a black Body retains more heat than a white one or any other such Colour, it will be very plain that their Skins must be thicker and denser to ward off the Violence of the Sun's beams.[40]

It was unctuous sweat of black skin which explained its "exemption from some Diseases such as the Itch, Prickly Heat, or Essere which no adult Negroes are troubled with, but those of fine skins are subject to." This is an early mention of prickly heat, a term not mentioned by Turner, Quincy (*Lexicon* 1719),[51a] or by Towne. It was, however, probably in use abroad by the English colonists and may have arisen from the Spanish 'calor picante.' In his massive *Medicinal Dictionary* of 1745, Robert James[32] had little to say on sudamina and did not use the expression 'prickly heat'; his description of 'essere') appears to be copied from Sennert. Johannes Fantoni (1747)[18] went back even further and quoted Ingrassia (on sudamina) almost verbatim and, as usual during this period (and later), without acknowledgment. Miliary rashes might occur without a fever, in which case, said Fantoni, they correspond to hidroa of the Greeks and the sudamina or sweat papules of the Latin writers. Writing on an epidemic of miliary fever in Cornwall, Huxham (1750)[30] insisted that the rash was often "a symptom of a symptom"—the profuse sweats—"for the miliary Glands of the Skin appear very turgid, and mimic a Rash upon profuse Sweating, even in the most healthy." As synonyms of sudamina, Jacob Woyt of Germany (1751)[69] gave two of the expressions ('Schwulen' and 'Schweissblaterlin') used a century before by Hafenreffer, but made no mention of 'Rothe Hund.'

An illustrious name in the history of prickly heat is that of George Cleghorn, one-time lecturer in anatomy at the University of Dublin and Surgeon to the 22nd Regiment of Foot. His textbook on 'Diseases of Minorca' (1751) may well be regarded as an early monograph on medical climatology. His dissertation on prickly heat appeared in a chapter entitled "Of the Rash, Essere and Cholera Morbus." The rash or prickly heat, he said:

> consists of numerous minute Pimples or rather round red Spots, just perceivable to the touch as a kind of roughness of the Skin which breaks out in different parts of the Body especially after Exercise or drinking cold water. The eruption is commonly looked upon as a Sign of Health. . . . But if accidentally the Pimples are driven in, by catching Cold, Bathing in the Sea or any other Error in the Non Naturals, the Case often becomes dangerous, and I have constantly observed that those who had a great deal of Eruption in the Summer were subject either to the Fluxes, Haemorrhage from the Nose, or Fevers . . . wherefore, I commonly advised them as soon as the slightest sign of Retrocession appeared (such as Sickness, Headach and Preternatural Heat), to lose some Blood immediately and make use of Mild Cathartics. . . .
>
> The Essere . . . though not uncommon in Minorca, appear much more seldom than the Rash. They are hard flat Tubercles of a pale colour and of different Forms, and break out chiefly while one is in Bed . . . with intol-

erable itching. They seldom continue out above an hour or two at a time, and suddenly vanish of themselves. . . . The Spaniards call them Ronchados, or Roncho a Nettle in the Castilian Language. In Minorca they go by the name of Favas, probably from resembling Beans in shape and magnitude. The Essere, as has been observed, often accompanies Tertian Fevers and appears most commonly in the Hot Fit.[14]

The word 'strophulus' (Greek, twisted bowel) is periodically met with in the literature of the sixteenth century onwards, and appears to be a variant of the earlier 'scrophula' or 'scrofula' ('scrofa'; Latin, brood sow). It may have arisen to describe a rash associated with bowel upset, but came to mean a pruritic papular rash occurring in infants. During the nineteenth century and later it was often used to mean prickly heat. 'Red gum' or 'red gown' were its common equivalents. According to some authorities, the first referred to teething rashes and the second was a rash resembling a red printed material. The obstetrician, William Smellie (1754),[60] spoke of a "small red eruption which in London the Nurses call the Red Gum but in Scotland is termed the Hives." Hives, however, was also a popular term for varicella, for variola, herpes or even urticaria. It may be noted that in etymology the English 'red gown' is somewhat related to the German 'Friesel' or 'Schweissfriesel' (Fries or Frieze, a kind of coarse woollen cloth)—an ancient expression for 'miliary fever.' Another old term to be noted periodically during the eighteenth century is 'crystalline rash' or 'chrystalli,' used to mean any clear vesicles particularly of a miliary nature (miliaria crystallina), but sometimes applied to chickenpox or to a syphilitic rash.

Hillary, Astruc, Moseley and Currie. Second Half Eighteenth Century

William Hillary (1759),[27] practitioner in the Island of Barbados, was another clinician to have personal experience of prickly heat.

It is certain [said he] that Insects (musquetos) do bite, and little bumps will arise . . . but the Efflorescences . . . proceed from the greatly increased Heat of the Climate, which continually rarifies and expands the circulatory Fluids and so exalts semi-volatalises and alkalises their natural soft semi-ammoniacal neutral Animal Salts, as to render them acid and unfit to pass thro' the small subcuticular vessels and Secretary Ducts without obstructing them and producing these troublesome itching Tumours.[27]

It may be difficult to follow the chemical ideas, but it appears that Hillary, like Towne, suspected that block to the exit of sweat could produce a rash. He continued in the following vein:

Whilst these Efflorescences continue, there are also others but smaller eruptive Pustulae, or little red Pimples, which arise from the same Cause, often coming out all over the rest of the Body called by the Greeks Hidroa, Essera of the Arabians, Sudamina of the Romans, and the Prickly Heat of the English, which cause great itching and prickling as if with a small needle. They usually continue several weeks and in some Persons for some months in the hotter Season; and declines or causes the Cuticle to gradually fall off in small white Scales. The Prickly Heat seizes most of the Inhabitants, both Native and Strangers . . . every Year during the hot Summer Months. It seldom causes any Sickness or Disorder, but everyone goes about his Business with it as if he were well; unless it be imprudently repelled and struck suddenly in . . . whereby they have repelled those acrid Saline Humours into the Blood and so have produced a Fever which has sometimes been associated with bad consequencies.[27]

Hillary made it plain that natives were subject to prickly heat, a matter not mentioned by Bontius and denied by Mitchell. As already pointed out, the expression sudamina was not used by the Roman physicians who wrote in Latin. This error was, however, common amongst writers of the sixteenth to eighteenth centuries. The remarks of Hillary on the nature of sweat are worthy of note:

But the common Sweat [said he] even of Persons who are well, when tested in this Climate, is so very salt and acrid that it tastes like the Salt or Spirit of Hartshorn mixed with Water in a considerable proportion which, being retained or being returned into the Blood, must dissolve it and stimulate the Solids also, and produce not only a Depuratory Fever, but if continued the Yellow Putrid Fever. Nature is constantly accustomed to a frequent and great discharge of the Animal Salts by the Sweat; which Sweat is always much more Salt than in colder climates; which Animal Salts are usually carried off by the Urine in colder Climates.[27]

To the modern physiologists, who assume that present-day ideas on the salt metabolism of sweat and urine are new, these concepts of Hillary, based no doubt on taste alone, may be somewhat revealing. About this period Haller added established opinion to the matter.

The Sweat is evidently of a saline Nature, as appears by its taste and from the Crystals which form on the Clothes of Glass-Blowers and by Distillation which demonstrates its alkaline nature. But in reality Sweat is always a preternatural Discharge and ought never to exist in a healthy Person, unless by violent bodily Exercise he has induced a temporary disease . . . and . . . being electrical, it is sometimes lucid.[26]

The part played during this period by Cullen, Franklin, Black, and Currie in developing the concept of the cooling function of sweat and insensible perspiration has been discussed elsewhere.[52a] In the anonymous *Traité des Tumeurs* (1759) Jean Astruc[5] dealt

lengthily with two disorders, 'echauboullure' and 'porcelaine.' On the first he said:

> This affection was called in Greek ἱδρωα and in Latin sudamina, because it comes from abundance and acridity of the sweat. In French it is given the name of Echauboullure, from the old verb 'Echaudbouiller' which signifies to heat up, because the skin is as if heated. In Languedoc, it is known as Cambriol from cambiar, meaning 'to change'; for the colour of the skin is changed. . . . The miliary or cutaneous glands are not engorged, and the seat of Echauboullure is not in the glands. . . . It is hence the extremities of the excretory Canals which are irritated and inflamed . . . by the excess of Salt in the Sweat passing through the Canals . . . brought about by repeated sweating . . . and the dissipation of the Serosity with which it is charged.
>
> On Porcelaine. This type of disorder was unknown to the Greeks and Latins except under the appellation of Exanthemata, Efflorescences, or Papules. The Arab physicians called it Sora or Essera. In Languedoc, where it is common, it is called 'Lou Mau Porcieu' or 'Pourcel' ('porcelet,' a young pig), from which, I think, the French call it Porcelaine. It may be red or pale. The Porcelaine is due to obstruction of the skin glands by sweat too abundant or too thick to pass through.

If the remarks of Hillary or Astruc on the cause of the sweat rash have a modern touch, it is well to remember that the idea can be traced to Fernel and earlier to Avicenna. Furthermore, the belief that fever, and disease in general, was due to block of the sweat pores is as old as the early Greek physicians. In etymology, 'echauboullure' seems related to prickly heat. If Astruc's explanation of the origin of 'porcelaine' is correct, we have an interesting relationship between the pig ('strophulus,' 'porcelaine'), the dog ('dog blisters', 'red dog'), and the sweat rash. Whether such relationship had its origin in sympathetic magic or in the resemblance of the rash to the animal's skin is not clear. The possible connection of 'dog' with the heat of the 'dog days' has already been pointed out. The word 'porcelaine' was later to become associated with rashes having the polished appearance of fine china. It found its way into the German as 'porcellanfriesel.'

William Cruikshank (1779)[15] could not reconcile himself to the generally accepted 'dew' theory of sweat. "For," he noted, "the sweat is most copious when there is least time allowed for condensation of the insensible perspiration; nor has it been proved that the surface of the body is thus colder or more capable of condensing this vapour than at any other time." On the matter of skin pores, Cruikshank did not mention the experiment of Turner. Of his own work he added: "I own that after some pains, and assisted with a pretty good microscope, I have not been able to

discover perforation in the cuticle or rete mucosum. . . . I believe, nevertheless, that they certainly exist."[15] Cruikshank ascribed the difficulty in finding pores to the elasticity of the skin which kept them closed except during the actual passage of 'perspirable matter.'[52a]

Plenck (1783)[48] gave a number of German synonyms for the sweat rash. Sudamina, was 'Schweissblattern,' and miliaria the 'Frieselblattern.' He referred to three types of sudamina—'rubra,' 'alba,' and 'balneantium'—but did not mention 'Rother Hund.'

In his essay on 'Animal Heat' (1785), Edward Rigby[53] followed most English physicians in not accepting the identity of miliary fever. The miliary eruption was, he said:

> . . . another very remarkable instance of the effect of an accumulation of heat on the surface; for though considered for a long time as a critical evacuation of febrile matter and constituting a peculiar disease, modern practitioners, I believe, are unanimous in attributing it solely to the skin having suffered a long continued preternatural degree of heat and sweating . . . and I have sometimes seen them on the chests of children in very hot weather, though they have been in perfect health, from their having sweated profusely and having had rather too thick cloathing upon them.[53]

Rigby put forward the concept, often met with in recent years, that miliaria are sometimes merely local, "as must have been observed, not infrequently, when a part has been a long time kept warm and moist by poultices."[53]

Benjamin Moseley (1787)[42] was another practitioner in a hot, damp climate to write on the sweat rash, but he added some confusion to the nomenclature:

> Most People, soon after arrival are attacked by what is called Prickly Heat. This is an Eruption of small red Pimples, unattended with Fever, which breaks out on different parts of the Body particularly where the Parts are kept hottest by the Cloaths, or where there is greatest Heat or Friction. . . . Sometimes it continues very obstinate and where People live heated by Intemperance, or have Serpiginous Humours in their Habit, it fixes itself on the surface of the Body in troublesome Ringworm. Indeed I cannot see any resemblance between the tropical Prickly Heat, Hidroa of the Greeks, or the Sudamina or Papulae Sudores of the Romans. . . . Cleghorn made a proper distinction between Sudamina and the Essere . . . but says the Minorca rash or Prickly Heat is the same as the Sudamina . . . which from the Climate I should think very probable.[42]

Like others, Moseley believed that prickly heat was part of the acclimatisation to heat, an indication of health. It was, therefore, unwise to turn it 'inwardly' ('retrocession'), with resulting 'metastasis,' by washing or bathing in cold water.

In 1792 Walter Vaughan of Rochester, England, wrote: "It is said that flannel always weakens, especially when worn next the skin. . . . They say Flannel may cause an Eruption . . . this would be very serious . . . but I deny it ever can."[66] There is abundant evidence that the 'flannel rash,' periodically mentioned in the literature was, in many cases, nothing but prickly heat. Quincy's dictionary of 1794 noted that hidroa or sudamina was the same as 'boa,' "a symptomatic kind of miliary fever. . . ."[51b]

James Currie had never been in the tropics but was, nevertheless, prepared to give advice on personal hygiene. Thus he wrote in 1797:[16]

> The perspirable Matter of the European does not appear to be well fitted to the torrid Zone. Consisting of nearly pure lymph, it is speedily dissipated by evaporation, and without a profuse discharge the surface cannot be kept moist and cool. . . . The negro, fitted by nature to the climate, is less accessible to the stimulus of heat, and his unctuous sweat less easily dissipated, keeping his skin uniformly moist, and sustaining a more uniform perspiration as well as evaporation. . . .[16]

In order to simulate the unctuous sweat of black skin—which Mitchell had said protected against prickly heat—Currie advocated the use of unguents by the white residents of the West Indies. Oils and unguents had, however, been in common use among the people of early civilisations, and Galen had advised anointing the skin with green aniseed oil for keeping the skin pores well open. The idea of Mitchell and Currie was to be brought up a century later by Pollitzer.[52b]

Acknowledgments

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Notes and Events

Edited by Dorothy M. Schullian*

Six Lister Letters

The Department of the History of Medicine of the University of Kansas has recently been presented with a series of six hitherto unpublished letters of Joseph Lister. These letters, written in the period September, 1894–April, 1895, were addressed to Charles Robert Straton, F.R.C.S. Edin., who had been one of Lister's house-surgeons in the Glasgow Royal Infirmary.[1] The letters are concerned with Lister's treatment of Straton's wife for what appears to have been a malignant tumor of the breast; they not only show Lister in action as a consulting surgeon, but also demonstrate his unaffected solicitude for his patient, and underline the fact that world-wide fame never divorced him from a sensitive appreciation of what disease can mean–not only to the patient, but also to those who are left to mourn. The last letter (27 April 1895) is a particularly fine example of Lister's simple unadorned sympathy, and is a model for those who would seek the right thing to say under similar circumstances.

12, Park Crescent,
Portland Place. [London] 24th Sept 94

My Dear Mr Stratton [*sic*]

I have just got your letter on returning from a tour in Norway.[2]
I am very sorry you have such a cause for anxiety.
I should be ready to see Mrs Stratton on Thursday at 11 a.m.

In haste for post
Yours very truly
JOSEPH LISTER

* Cleveland, Ohio.

1 Charles Robert Straton (1842-1918): his professional attainments are listed in *The Medical Directory* until 1918, and an excellent obituary appeared in the *British Medical Journal* (1918, 1, 302-3). Straton seems to have been something of a "renaissance man"–he studied law before turning to medicine, and natural history was among his many nonmedical interests. The above obituary notice mentions that "a piece of work which took him seven years to complete, and one by which his name will always be remembered by historians, is the *Survey of the Lands of William, 1st Earl of Pembroke*, published in 1909 by the Roxburgh Society in two fine quarto volumes." Of particular interest in connection with the present paper is the statement in the *British Medical Journal*'s obituary that he " . . . was house-surgeon to Lord Lister in Glasgow, and remained his friend."

2 Although Lister and his wife visited Norway in the summer of 1879 (R. J. Godlee. *Lord Lister*, London, 1917, p. 506), the above-mentioned trip is not recorded in any of the biographies–Godlee, Cameron, Guthrie–consulted.

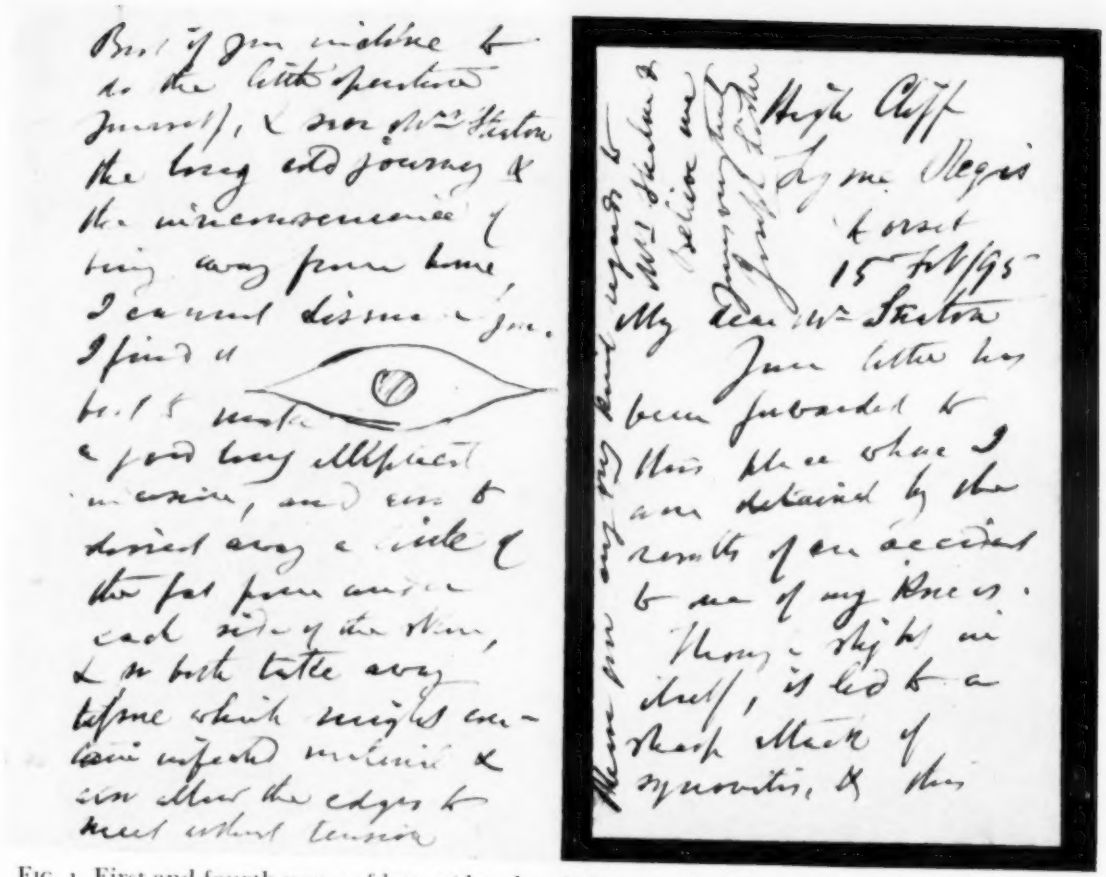

FIG. 1. First and fourth pages of letter (dated 15 February 1895) from Lister to Charles Straton.

12, Park Crescent,
Portland Place. 28th Oct 1894

My dear Straton

I am glad to learn that the journey was well accomplished and that healing is complete.

I need hardly repeat that it was a real pleasure to me to be able to help you and your amiable help mate.

With kind regards to her I remain

very truly yours
JOSEPH LISTER

12, Park Crescent,
Portland Place. 6th Nov 1894

My dear Straton

The contents of your letter, though they grieve me, do not surprize me. Considering what a multitude of scattered nodules we found in the axilla, it was only too probable that others might be present too small to be detected.

I feel quite sure, I regret to say, that no further operation ought to be attempted.

Soothing treatment, such as you are using, is all that is justifiable.[3]

With sincere sympathy
I remain
very truly yours
JOSEPH LISTER

High Cliff
Lyme Regis
Dorset
26th Dec 1894

My dear Mr Straton

I hardly know whether to scold you or thank you for having constrained me to accept a fee in the shape of the beautiful work of art[4] which arrived just before I left London for this place. However I suppose the thanks must prevail, and I send them very cordially.

I have received your kind letter this morning and also one only too kind from Mrs. Straton.

Please give her my best thanks. The report you give seems really very encouraging.

It makes me hope that the swelling you spoke of soon after her return home was only a little inflammatory disturbance.

Most sincerely hoping that such will prove to have been the case, and wishing you both much happiness in the coming year

I remain
very truly yours
JOSEPH LISTER

[3] Things have not changed too much since then, although nowadays X-ray therapy, hormone administration, or even bilateral adrenalectomy might be used to stave off death for a few more months or, with luck, years.

[4] I have been unable to discover what this was. Straton's grand-daughter has suggested to me, however, that it "was probably some very ordinary gift."

High Cliff
Lyme Regis
Dorset
15 Feb/95

My dear Mr Straton

Your letter has been forwarded to this place where I am detained by the results of an accident to one of my knees.

Though slight in itself, it led to a sharp attack of synovitis, & this has proved very tedious.[5]

I now make progress daily and have some hope of being able to return to London next Thursday. But I cannot be sure of this, and I fear that, even if I can, it will be some considerable time before I can attend to such a comparative trifle as the removal of this little nodule. So far as I can judge without seeing Mrs Straton I certainly think it should be removed.

If it would be more satisfactory to you to have it done in London, I would advise you to apply to Mr. Godlee,

R. J. Godlee
19 Wimpole St
W.

He helped at the former operation, & I am sure he would, as gladly as ably, do what is needed. I would not advise you to wait for me. But if you incline to do the little operation yourself, & save Mrs Straton the long cold journey & the inconvenience of being away from home, I cannot dissuade you. I find it best to make a good long elliptical incision, and also to dissect away a little of the fat from under each side of the skin, & so both take away tissue which might contain infected material & also allow the edges to meet without tension

Please give my very kind regards to Mrs Straton &

Believe me
Yours very truly
JOSEPH LISTER

12, Park Crescent,
Portland Place. 27 April 1895

My dear Mr Straton

I have seen the sad announcement in today's Times;[6] and as one who knows too well what such a stroke is, I send you the expression of my sincere and deep sympathy.[7] The favourable reports soon after your return home made me indulge the hope that your dear, gentle partner in life & fellow-worker would be spared to you.

[5] Godlee *(op. cit.* pp. 572-573) records how, in his seventy-fifth year (1901), "a knee strained in early days had on many occasions been a cause of anxiety to him; for, blessed as he was, for the most part, with robust health, any slight illness was treated with perhaps more respect than it deserved. Now it was almost always painful, and he suffered a good deal from rheumatism, or perhaps it was gout, and other troublesome ailments."

[6] *The Times,* 27 April 1895: "STRATON—On the 28th April, at West Lodge, Wilton, Salisbury, AMY MARY, wife of CHARLES ROBERT STRATON, F.R.C.S., and daughter of the late Henry James Fowle Swayne, Recorder of Wilton, aged 41."

[7] Lister's own wife had died in 1893 (erroneously given as 1903 by Bradford in the *Dictionary of National Biography*) and after her death he used the black-bordered notepaper and envelopes (see Fig. 1) for his personal letters.

That you may be comforted in your great sorrow, and that you may find solace in the active work of our noble calling is the earnest wish of

yours very sincerely
JOSEPH LISTER

ACKNOWLEDGMENT

I am grateful to Mrs. Mary Yates, Charles Straton's grand-daughter, for her kindness in presenting these letters to the University of Kansas, and for allowing me to publish their contents.

L. R. C. AGNEW

On the Nature of Sweet Oil of Vitriol

In the *De artificiosis extractionibus* of Valerius Cordus, published in 1561 by Conrad Gesner, there appears the first published procedure for preparing a liquid called by Cordus sweet oil of vitriol ("dulce Vitrioli oleum") by the distillation of a mixture of alcohol and sulfuric acid. A translation of Cordus' own description follows:*

Take 6 oz. of strong wine that is very sharp and triply distilled and the same amount of sour oil of vitriol. Mix in Venetian glass and place in a small cucurbit with a narrow orifice. Seal the orifice very well with clay and leave it thus for a whole month or two. Then pour into a cucurbit to which is immediately attached an alembic. Place in a small furnace and half cover it with ashes. Afterwards attach the receiver, seal the joint carefully with clay, and extract the 6 oz. of strong wine which you poured in—indeed for doing this more safely, place it in a hot water bath so that the wine alone ascends separately from the oil. Now, when by using the hot water bath you have extracted the 6 oz. of wine that had been added, place what remains into the furnace so that the sand touches the middle part of the cucurbit, attach a new, empty receiver (not a large one), and seal the joint carefully with clay. Then light a gentle fire and gradually draw out all moisture that is left in the cucurbit until no more is seen in the bottom. The greatest care and diligence are always applied to moderate the fire thus, lest the liquid should boil out continually up to the channel of the alembic. For if the boiling reaches this, it cannot be calmed or prevented from going over into the receiver and spoiling all the oil. Indeed, it customarily boils very readily. Now, when you have drawn it out gradually, immediately withdraw the receiver with its liquid, and you will see that two things are contained in it, that is to say, a watery liquid and an oily or fatty one. However, you will immediately separate one from the other so that none of the watery liquid remains in the oil, for that water spoils the oil. Also this same oil customarily spreads over the water for the most part, especially if the wine which was previously added is completely removed by the hot-water bath, but you will be able immediately to distinguish the oil from the water by touch. For the oil is greasy, the water not at all so. Then keep the separated oil for use.

* A complete translation of the third part of the *De artificiosis extractionibus* has been published by G. K. Tallmadge (*Isis*, 1925, 7, 394-411). The translation which follows was made independently and then compared with Dr. Tallmadge's. No difference in interpretation was apparent, but where certain of Dr. Tallmadge's expressions seemed more pleasing, slight adjustments were made.

The importance of this passage is that it has been called the first published description of the preparation of ethyl ether, and Cordus has been credited with being the discoverer of ether.[3,4] On the other hand, Sudhoff[7] has argued persuasively that Paracelsus was the first to prepare ether; and Darmstaedter[1] has claimed that the procedure described by Cordus would not result in the formation of ether at all but would yield instead diethyl sulfate.

The properties ascribed by Cordus to his product do not agree well with those either of diethyl sulfate or of ether. His sweet oil of vitriol was described as floating on water and readily volatile, both of which properties fit ether well but diethyl sulfate not at all. On the other hand, Cordus also described it as oily ("pingue") and spoiled ("perdit") by water, observations applicable to diethyl sulfate but not to ether. Leake[3] has emphasized the first two properties to bolster his argument and Darmstaedter[1] the second two to support his. It is indeed satisfying to be able to report here that Cordus really did know what he was talking about, that his product did have all four of these properties, and that, as in many similar cases, the truth lies somewhere between the two opposing positions.*

The problem has been resolved merely by repeating the experiment, following the directions given by Cordus. The only discrepancy to be noted is that no distillate could be collected by heating on a hot water bath. It was necessary to reach a minimum temperature of 125° C. before any liquid distilled over. Possibly Cordus was only speculating that a water bath would be a good way to do this; or else his reagents may have been considerably less anhydrous than our present-day ethanol and sulfuric acid so that a large amount of unreacted, distillable alcohol remained in the equilibrium mixture. To a temperature of 140° C. the primary product in the distillate was found to be ethyl ether, notwithstanding Darmstaedter's opinion that this could not form under these conditions. As the temperature increased, diethyl sulfate could also be identified in the distillate, and finally above 175° C. water distilled over.

The liquid collected between 140° and 175° C. apparently represents Cordus' sweet oil of vitriol. By virtue of its being a mixture of ether and diethyl sulfate, it possesses the four properties observed by him which fit neither component singly. It contains enough ether to be lighter than water and enough diethyl sulfate to feel oily. It is spoiled on standing with water since the ester is hydrolyzed. (Most likely what Cordus noticed was the disappearance of the distinctive odor of diethyl sulfate.) It appears to evaporate rapidly although, in truth, it is only its ether component which does so. The only additional observation which should be made is that Cordus probably lost much of the ether component and obtained a product richer in diethyl sulfate than that obtained by using the efficient, water-cooled condensers of today.

* Editor's Note: Dr. Robinson's conclusions as expressed in this note have been submitted to Dr. Leake, who has reported his hearty approval of them.

The argument, then, appears to be settled. Cordus did prepare ether; but to say merely this seems to miss an important point. The significance of any discovery can be judged only in its context. It must be stressed that the later history of sweet oil of vitriol parallels and to a great extent is independent of the history of ethyl ether and anesthesia. It was the same sort of discovery as the discovery of America by Leif Ericsson—it did not lead to the consequences which today we consider the important ones.

Nevertheless, sweet oil of vitriol has a long and distinguished history in pharmacy, extending nearly to the present day. It was investigated jointly by Robert Boyle and Isaac Newton.[2] In the seventeenth century it was known by many names, such as *aqua Lulliana, aqua temperata,* and *oleum dulce Paracelsi.* Finally it achieved lasting fame as Hoffmann's anodyne *(liquor anodyni mineralis Hoffmannii)* when prepared and publicized by the German physician, Friedrich Hoffmann (1660-1742). William Lewis in his *Materia Medica*[5] of 1761 described the preparation of Hoffmann's anodyne by essentially the same procedure as that used by Cordus two hundred years earlier, and he understood it to be a mixture of two products, one oily and one very volatile. By 1818 the London Dispensatory directed that Hoffmann's anodyne should be prepared by mixing together specified quantities of its two components rather than obtaining the ill-defined mixture in a single distillation. At the end of the nineteenth century this preparation was still considered a very valuable one for preventing nausea and as an anodyne and tranquillizer.[8] It survived into the 1950 edition of the *U. S. Dispensatory*[6] and disappeared only with the 1955 edition. This is a long history for any drug; and rather than thinking of Cordus as paving the way for ether anesthesia, it seems appropriate in this Miltown age to regard him as the first man to synthesize a tranquillizer.

Finally, let me stress again, the sweet oil of vitriol of the early chemical literature cannot reasonably be regarded as a single compound. It makes sense only to consider it a mixture of diethyl ether and diethyl sulfate.

TREVOR ROBINSON

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Three Portuguese Remedies of the Fifteenth Century

The fifteenth century represents in Portuguese medicine, as in other activities in Portugal, a period of transition. Although only one chair of medicine existed until 1493, although the medical theories in vogue were largely those of Galen and his Arab followers rather than those of Hippocrates, signs of change were evident. To prevent unqualified persons from treating the sick, royal decrees in 1430 and 1448 required physicians and surgeons to pass examinations. In 1461, another decree determined the rights and duties of apothecaries. Measures were taken to combat contagious diseases: streets were ordered swept, gutters cleaned, and a quarantine against foreign ships was enforced. Small, inadequate hospitals were merged into larger and more efficient institutions.

A reflection of the state of Portuguese medicine of this time is to be found in the oldest Portuguese manuscript in the National Library of Naples, an anonymous treatise which bears the number I-E-33 and which dates from the end of the fifteenth century. Alfonso Miola, in his *Notizie di manoscritti neolatini—Parte prima* (Naples, 1895), describes it as a bound octavo document with paper pages. Most of the seventy-four folios of this manuscript are devoted to recipes, divided into sections on meat, egg, and milk dishes, and preserves. Folios 72-74, however, contain three prescriptions, for toothache, for quinsy, and for burns, which match the recipes in the strangeness of their ingredients.

Four unidentified persons are mentioned in this collection in connection with recipes or prescriptions: Dom Luis de Moura, who prescribed for toothache, Dona Isabel de Vilhana, inventor of a milk and egg pudding and of a cheese pancake, and Catherina Ximenes and a certain Dona Joana (perhaps the Portuguese princess of that name), each of whom furnished a recipe for quince marmalade.

The manuscript has never been published, except for a short extract in the anthology of J. Leite de Vasconcellos, *Textos Arcaicos*, 3d ed. (Lisbon, 1923). The translation of the prescriptions given here has been kept as close to the original as possible in order to preserve the flavor of the author's quaint and occasionally involved style.

PRESCRIPTION OF DOM LUIS DE MOURA FOR TOOTHACHE

You will take two *canadas*[1] of red wine in a new pot. Put into it a little green myrtle, and a little rosemary, and a handful of wormwood, and a few dried roses, and a handful of crushed scales of pine-cones, and some pomegranate rinds, and a small handful of salt, and a silver spoonful[2] of crushed pepper, and a drinking-cup full of honey. All this has to boil so that it decreases by three inches in the pot. And then when you throw yourself into bed at night, cover your head very well with a towel folded on top of your head, and with some small cloth cloak, so that no vapor

[1] Portuguese liquid measure, equal to three pints.
[2] Perhaps a small spoon, such as a teaspoon, is meant.

escapes. And then you will thus take that vapor[3] with your head over the pot, and stay there for as long as that mixture gives off vapor. And you will have put aside a little of this mixture so that at the end you can rinse your mouth with it lukewarm, and you will keep it thus a little while in your mouth. And in the opening of the pot there must be a towel wrapped like a dishcloth[4] so that that vapor does not come out violently dispersed, because then it will scald your face, but rather as much as the opening of the pot says.[5] And then cover yourself very well, so that the air does not blow on you.

PRESCRIPTION FOR QUINSY

You will take cinnamon, which is very good, and nutmeg, a half ounce of each one of these things, and a quarter ounce of ginger, and an eighth of an ounce of dog's dung which is very white and dry, and four or five cloves, one ounce, and refined sugar. All has to be well ground and sifted and well mixed, one thing with the other. And you will give to the one who has quinsy as much powder of this as you can take with three fingers, and you will put it as far down in his throat as you can, and after it a mouthful of cold water. And you will give it to him in this way three times, one after another. And you will give it to him for three or four days continually if he is not cured in the first three days.[6]

PRESCRIPTION FOR FIRE OR SCALDING

You will take rose-vinegar and rose-water, in equal parts, as much as seems necessary for the size of the burn. And you will take one or two whites of egg, and you will beat it well, and you will throw in powder of Armenian bole,[7] and you will keep on beating the said rose-vinegar and rose-water and white of egg until a paste is formed that is more thin than thick. And whenever some person burns or scalds himself you will apply some old cloths of unbleached linen, dipped in this paste, and as soon as one cloth is dry you will place another, if the burn is severe; if it is small, once is enough. And in three or four days days it will be cured, and if not, the burn having peeled. . . .[8]

KIMBERLEY S. ROBERTS

History, General and Specific

William L. Langer's presidential address, "The Next Assignment," which was delivered before the American Historical Association on 29 December 1957 and published in the *American Historical Review*, 1958, *63*, 283-304, points up the fact that during the past half century the scope of historical study has been enormously extended. He believes, however, that there is still ample scope for penetration in depth, and that in particu-

[3] That is, breathe the steam given off by the pot.

[4] The opening of the pot should be partly stopped up by a cloth to keep the steam from escaping too rapidly.

[5] That is, the patient can regulate the amount of steam by making the towel cover more or less of the opening. The use of the verb "to say" in this sort of context is unusual.

[6] If the patient does not recover in three days, he must continue this medicine for three or four days more.

[7] A clay sometimes used in pharmacy.

[8] The MS. ends abruptly at this point.

lar there should be reorientation on the Freudian principles which received new prominence in the anniversary year of 1956. Historians in his opinion should be especially concerned "with the problem whether major changes in the psychology of a society or culture can be traced, even in part, to some severe trauma suffered in common, that is, with the question whether whole communities, like individuals, can be profoundly affected by some shattering experience."

In the history of medicine all this has a special application, and Professor Langer devotes several pages to the long-range psychological repercussions of the Black Death and other epidemics. But medical historians should be aware that the matter is all part of an ever-current examination into the principles of historiography, and that if they are to be good medical historians, they must watch the trends of general history as well as those in their specific segment of the discipline. Lucian wrote in the second century of our era a minor essay which is a systematic introduction to historiography. Historians before and since have dissected their own methods and will continue to do so. There is nothing profound in the lines set down here; they are simply a plea that medical historians be alert to what other historians are discussing and that they adopt gratefully whatever practices would be helpful to them. There is a wealth of suggestion, e.g., in such articles as Professor Langer's (and the comment upon it by Harry B. Williams in *American Historical Review*, 1958, *64*, 262-263), Meyer Berger's on Allen Nevins' Oral History Project (*New York Times*, 13 January 1958; cf. Saul Benison in *Isis*, 1959, *50*, 64-65), the editorial "History and Humanism" on Hugh Trevor-Roper's *History Professional and Lay* in the *Times Literary Supplement* for 20 December 1957, the lead article "Crypto-Historicism" reviewing Philip Bagby's *Culture and History* in the same organ for 3 October 1958, and its editorial "Howing and Whying" in the issue of 2 January 1959.

A somewhat different side of the picture has been presented recently in the *Times Literary Supplement* for 9, 16, 23, and 30 January 1959. An editorial "Science in History," on the inaugural lecture delivered by Douglas McKie when he became head of the Department of the History and Philosophy of Science at the University of London, urged that the study of the history of science be introduced into humanistic disciplines and that the history of science be identified with the science of history. This called forth immediate responses from A. C. Crombie, D. Hamilton, G. R. Elton, J. Goodier, and F. N. L. Poynter. The last-named, finding in England shining examples of the devotion of scientists to the history of science, detects, in spite of the wealth of research material which awaits their attention, no comparable interest among professional historians in his country. He throws down the glove, in fact, by reminding the professionals that by contrast "a professor of history at Stanford University is an acknowledged authority on Vesalius; another at the University of North Carolina is an accepted expert on medieval medicine; while yet another, at Rutgers Uni-

versity, has already made valuable contributions to the history of pharmacy." May historians in Britain accept the challenge!

Physis, Anno I (1959), Fasc. 1

With the year 1959 a new journal for the history of science made its appearance in the city of Florence. Its name, *Physis,* is the happy suggestion of Andrea Corsini. It was founded by the Domus Galilaeana di Pisa, the Istituto e Museo di Storia della Scienza di Firenze, the Museo Nazionale della Scienza e della Tecnica di Milano, and the Gruppo Italiano di Storia della Scienza, and is published by Leo S. Olschki for these organizations and under the auspices of the Consiglio Nazionale delle Ricerche. The Editor is Vasco Ronchi; Associate Editors, competently assisted by Maria Luisa Bonelli and Tullio Derenzini, are Giovanni Polvani, Andrea Corsini, and Guido Ucelli.

Requests for subscriptions at $9.00 a year, should be sent directly to Casa Editrice Leo S. Olschki, Via delle Caldaie 14, Florence. Articles will be accepted in Italian, French, English, Spanish, and German. The current fascicle includes sections for original articles, reviews, news notes, and necrology and a list of publications received. Of medical interest is Luigi Belloni's article, pp. 31-40, "Demonismo e 'Yerba Mate' (Ilex paraguariensis) nel giudizio del medico G. A. Clerici."

The Journal extends warm greetings to this sister publication and wishes for it a long and fruitful life in the service of the history of science.

A Gracious Acknowledgment

Recently the Journal sent several back issues on request to a college of medicine in a Far Eastern country. The following warm, generous, and colorful message has been received in acknowledgment: "I, with my co-researchers, want to express our hearty gratitude for your donation of . . . these precious back issues which we have thus far badly wanted to have. These issues will, I am sure, do for us just as the rain does for the dried earth."

D. J. Davis Lecture

Dr. Lloyd G. Stevenson of Montreal delivered the annual D. J. Davis Memorial Lecture on Medical History at the Medical-Dental-Pharmacy Building of the University of Illinois College of Medicine on 22 April 1959. His subject was "The Early Development of Internal Medicine in the United States."

Historical Fund, Medical Department USN

A recent inquiry made of Rear Admiral Bartholomew W. Hogan, Surgeon General U. S. Navy, concerning historical activities of the Bureau of

Medicine and Surgery has brought the following information which Admiral Hogan graciously permits us to quote from his letter of 30 January 1959:

Since Captain Roddis's retirement, the Bureau has been without a Historical Division, but not too long ago we created a "Historical Fund of the Navy Medical Department," the Chairman of which is Rear Admiral Frank P. Gilmore, MC, USN. The mission of this committee is indicated by the enclosed item, which has been publicized in the more recent issues of the Navy Medical News Letter.

The status and importance of Aviation Medicine has progressed to the point where we now have an Assistant Chief of the Bureau of Medicine and Surgery for Aviation Medicine, who presently is Captain Oran W. Chenault, MC, USN. Additionally, he serves as Director of the Aviation Medicine Division, and has on his staff representatives assigned to such branches as Physical Qualifications, Aviation Medicine Training, Aviation Operational Psychology, and a Director of an Aviation Medicine Technical Division, which concerns itself with systems requirements, aviation medical equipment, and safety and flight training.

The announcement concerning the Historical Fund, which appeared in the *United States Navy Medical News Letter* (4 July 1958, *32*, 2) reads as follows:

A committee has been formed with representation from the Medical Corps, Dental Corps, Medical Service Corps, Nurse Corps, and Hospital Corps for the purpose of creating a fund to be used for the collection and maintenance of items of historical interest to the Medical Department. Such items will include, but will not be limited to, portraits, memorials, etc., designed to perpetuate the memory of distinguished members of the Navy Medical Department. These memorials will be displayed in the Bureau of Medicine and Surgery and at the National Naval Medical Center. Medical Department officers, active and inactive, are invited to make small contributions to the fund. It is emphasized that all donations *must* be on a *strictly voluntary* basis. Funds received will be deposited in a Washington, D. C. bank to the credit of the Navy Medical Department Historical Fund, and will be expended only as approved by the Committee or its successor and for the objectives stated.

It is anticipated that an historical committee will be organized at each of our medical activities. If you desire to contribute please do so through your local historical committee or send your check direct, payable to Navy Medical Department Historical Fund, and mail to:

Treasurer, N.M.D. Historical Fund
Bureau of Medicine and Surgery (Code 14)
Department of the Navy
Washington 25, D. C.

Committee

F. P. GILMORE, Rear Admiral (MC) USN, Chairman
R. W. MALONE, Rear Admiral (DC) USN
W. C. CALKINS, Captain (MSC) USN
R. A. HOUGHTON, Captain (NC) USN
T. J. HICKEY, Secretary-Treasurer

Bicentennial of the Birth of Vincenzo Chiarugi (1759-1820)

On 22 February 1959 the city of Empoli in Tuscany paid honor to its great native son, the psychiatrist Vincenzo Chiarugi, whose pioneer efforts on the principle of "no restraint" brought hope and encouragement to patients in mental hospitals and whose publication, *Della pazzia in genere e in specie* (Florence, 1793, 3 vols., Garrison-Morton 4921), is today a monument of medicine.

Ceremonies began in the morning with a reception in the Biblioteca Comunale and a speech of welcome by the Mayor. The main commemorative address, entitled "La figura di Vincenzo Chiarugi," was delivered by Prof. Dott. Filippo Cardona, Director of the Neurological Clinic of the University of Florence. Prof. Dott. Mario Nistri, Director of the Psychiatric Hospital in Florence, reviewed Chiarugi's life and works, and in the afternoon communications of a scientific character were read.

Not the least moving among the ceremonies were the simple but significant acts of laying a wreath upon Chiarugi's tomb in the church of Santo Stefano degli Agostiniani and unveiling an inscription in the Via Vincenzo Chiarugi where his house once stood. His great classic may be consulted in the United States at the Yale Medical Library (the copy presented by Harvey Cushing to Clements Fry) and at the National Library of Medicine.

Notes From India

The Department of History of Medicine, opened in September 1956 in the Andhra Medical College, Visakhapatnam, and transferred to the Osmania Medical College, Hyderabad, in March 1957, is at present accommodated in the Nizam Bagh Guest House, Inside Salar Jung Museum Compound, Hyderabad. It has now been upgraded with the aid of the Government of India.

Dr. D. V. Subba Reddy, M.B., B.S., M.Sc., Professor of the History of Medicine, has been appointed as the Director of the Upgraded Department or Institute of History of Medicine and additional staff, members such as a librarian and Sanskrit and Arabic scholars are being appointed. In addition to the course of 10 to 12 lectures for the undergraduates and two to four lectures on each of the specialties for the postgraduates studying for diplomas and degrees, the Osmania University has recently instituted a Postgraduate Diploma in the History of Medicine extending over one year.

The Department or Institute of the History of Medicine will be glad to exchange programs of lectures, syllabi, reports of Departments of the History of Medicine, reprints, publications, and duplicates, and other

materials with other institutions and individuals. All interested persons and institutions are requested to note the change in address.

Upgraded Department of History of Medicine
Osmania Medical College,
Nizam Bagh, Diwan Devdi,
Hyderabad-Deccan,
Andhra Pradesh (India).

The Victor Robinson Prize

The Journal announced recently (1958, *13*, 423) the first annual Victor Robinson Lecture at Temple University, which was delivered by Dr. George Rosen on 23 September 1958. It is happy to report now another honor to the memory of the celebrated medical historian. Mr. S. R. Shapiro of New York has instituted at the University of Oklahoma the Victor Robinson Prize in the History of Science. By this, the sum of $50 and a parchment scroll will be awarded to the student at that university who during the academic year 1958-1959 contributes the best essay on any subject in the history of science.

Exhibition at the Royal College of Physicians of London

A mimeographed list dated 29 January 1959 describes in fourteen pages the thirty-four items displayed at the Royal College of Physicians of London for the exhibition "Physical Examination in the Past." They demonstrated the prominence of uroscopy and sphygmology from very early times, of percussion and auscultation, and of the clinical thermometer, the introduction of which in its present form is usually attributed to Sir Thomas Clifford Allbutt.

Book Reviews

GEORGE SARTON. *A History of Science.* Vol. 2. *Hellenistic Science and Culture in the Last Three Centuries B.C.* Cambridge, Harvard University Press, 1959. xxvi, 554 pp., 112 figs. $11.00.

Reviewed by DEREK J. DE SOLLA PRICE, *Institute for Advanced Study, Princeton, New Jersey.*

THIS is Sarton's last book. It was through his major writings—the *Introduction* and *Isis*—rather than through his personal presence that he achieved the crucial task of building our field from the labor of rare specialists to a recognized and autonomous scholarly discipline. It is therefore a grave matter to review this last major contribution and to decide where it takes us and whence we must proceed.

At his death on 22 March 1956, Sarton had completed, checked and revised the typescript of this second of eight or nine projected volumes of the *History of Science* and had selected the illustrations. It now appears, dedicated to Charles and Dorothea Singer, and with a foreword by I. Bernard Cohen who also located sources and checked references in the text. The work of supplying an index and correcting proofs was seen through by Edward Grant, and other corrections were made by Duane Roller and C. Doris Hellman. The publishers also note the co-operation of Miss May Sarton, author of delightful *New Yorker* stories about her father, in the preparation of the book.

Most welcome is the news that Harvard University Press is making plans to continue the series, although Sarton's plans for the subsequent volumes are known only in the most general way. One must agree with Cohen that the work of others is bound to differ in almost every direction from that we should have expected of Sarton. There is, however, some considerable possibility that the series would not be finite like Singer's *History of Technology,* but that like the *Introduction* it would have expanded into a number of volumes and bogged down before reaching the mid-point of the set. The volume on Islamic Science that he could so well have written (and indeed a source-book in that field) must remain a strong teaching desideratum, and this reviewer for one bitterly regrets that Sarton never had an extensive publication dealing with 18th or 19th century science, a wood where only his comprehensive scholarship could have lifted us from a myopic view of the individual trees. For the European middle ages and the scientific revolution there are now a reasonable number of excellent modern treatments and it might well be more efficient to deploy the resources of this series elsewhere for the moment.

Everybody concerned with our field has felt the need for some full and scholarly treatment of the crucial area of Hellenistic Science. Now

we have that book we shall all use it and be duly grateful for the mine of information that it makes so readily available. Sarton, always most concerned and explicit about the aims and devices of his scholarship, has laid down his principles so often that we know exactly what to expect from him in content and in his idiosyncrasies. His aims are now so rightfully imbedded in our discipline that even where one might disagree, one learns from him exactly what his inspiration sought to teach.

This said, we must state and accept all the consequences of the fact that his great love of science was, in spite of the appearances, that of the humanist, not of the scientist. As a humanist he was such a giant that it in no way belittles him to point out that neither from this book nor any of his others could one divine the existence of his two unpublished scientific studies on autocatalysis (1906-8) and on Newtonian mechanics (1911) or of any professional scientific education. As a matter of fact he has recorded that at one stage, soon after his translation to America, he nearly decided to devote much of his time to the study of oriental art. In his efforts to consolidate our subject it was perhaps inevitable that he should swing the pendulum too far towards the humanities, but now we might allow ourselves the luxury of resting on his scholarship at this extreme and seeking the scientific content of our material.

It is for such reasons that the major fault one must find in this volume, as in the first volume and indeed in most of Sarton's other writings, is a certain sketchiness in presenting an analysis of what was actually achieved in any piece of scientific work and the means by which it was achieved and recorded. The effort in this direction is minimal to the major task of Sarton in clarifying the historical and bibliographical contexts. In such technical regions as mathematics and mathematical astronomy in this Greek and Babylonian period, the too cursory treatment of content is misleading. One might supply a corrective by the use of the Cohen and Drabkin *Source Book in Greek Science,* but there is a lacuna between this book and that for which I would gladly have traded all Sarton's background chapters on Religion, Arts, Letters, Philology, and Orientalism.

We all know though that to find such a fault is to criticize Sarton for being Sarton. The same may be said if one takes exception to his scientific transliteration of Greek which, in this work, is carried to a greater extent than in the *Introduction.* We take his point that it is useful to distinguish between Greek and Latin, and that it is desirable to give the non-Hellenist and the printer a freedom from Greek type that shall nonetheless be without ambiguity or enigma. However, there are a few centuries of classical scholarship in our language which has become used to transliterating Greek through a Latinization, and one fears that even Sarton cannot divert this stream by standing to one side and beckoning all to follow him. He intends to be consistent without pedantry, but surely it is not necessary to write *Peiraieus* and *Rhodos.* When a proper name is sufficiently well known to

be made into an adjective, is it not confusing to use the ē and ō (for ēta and ōmega) in the name but to revert to e and o in the adjective as he does for Archimēdēs, Apollōniōs and Hēracleidēs? The long vowels have also proved treacherous elsewhere in the proof-reading and indexing; thus Archimedes (p. 57), Ctesibios of Alexandria in the index, and a confusion of Euclid of Megara in the index where the reference to p. 36 is to the misnomer of the geometer, and hence accurate, whereas that to p. 159 should be the pupil of Sōcratēs, correctly spelled in the text as Eucleidēs.

In general criticism of the book too, one must mention the illustrations, the majority of which are admirable and useful reproductions of incunable and renaissance scientific classics. A few are too small to be clear, but only one (Fig. 96, p. 456) is so bad as to be unpleasant. It seems a very great pity that the author has not chosen to provide us also with a few more illustrations of actual Hellenistic objects, or even Byzantine manuscripts which might evoke the period more faithfully and usefully than these renaissance editions. Many fine scientific artifacts, such as sundials, surgical instruments, drawing instruments exist and might have been shown; others have been faithfully reconstructed and would be available in good illustrations. One does not regret the service of the illustrations to inculcating a good sense of bibliography in the student, but in this instance it would have been possible to give so much more. Thus, for example, in Chapter XX, dealing with Physics and Technology in the last two centuries before Christ, there are so many illustratable things in the works of Ctēsibios, Philōn, and Vitruvius. Yet we are given six title-pages and only one very schematic diagram of a water-clock, a pair of small pictures of bridges and a full plate of an 18th century painting of the Pantheon. The keyboard organ of Ctēsibios might well have been shown from the fine specimen preserved at Aquincum, and at least one Hellenistic sundial could have replaced the curious statement that "We need not refer to sundials, which were of no use except when the Sun was shining."

In organization, the book is divided into two parts; the first dealing with the third century B.C. (actually from the death of Alexander in 323 B.C.) and the second part dealing with the remaining two centuries before our era. Sarton considers the first part to be the period of the Alexandrian renaissance, the second to be that of the decadence and fall of Hellenism. In terms of the history of science, rather than of general history, the epithet of the second part is questionable for here one finds no hint of fall or decadence. A similar separation may be remarked in that revival of the exact sciences in Europe which accreted around the Reformation when the revival of arts and culture of the Renaissance was already past its best days.

The first part, of 215 pp., comprises almost equal portions of history of science and of background material. The two introductory chapters set the scene of the Alexandrian renaissance and describe the Museum.

On one point of detail, an opinion that Seleucid astronomy gave little to Greek astronomy except for some observations used by Hipparchos, it seems likely that Sarton has underestimated the position through his lack of knowledge of the content. In truth we know almost nothing of the interrelations of Greek and Seleucids in this period, but the more that is revealed by technical analysis, the more we feel that the Greeks benefitted considerably from the highly developed corpus of Babylonian astronomical theory which was available to them. In the description of the Museum (p. 31 and again p. 36 n.2) it gives a very wrong and anachronistic picture to state baldly that the building would probably have contained an observatory, a dissecting room, and zoological and botanical gardens. One did not need much in the way of permanent facilities for experiment, and equipment in general consisted, so far as we know, either of small portable pieces that were personal property, or objects like public sundials and perhaps equinox-determining mounted rings that would be erected monumentally in the public domain. Only perhaps by the time of Ptolemy was there assembled a sufficiently varied and massive array of instruments (which still might have been private property) that one could legitimately speak of an 'observatory.'

In the sections on history of science which follow in this part of the book, I have already noted that the chapter on physics and technology is the poorer for the lack of reference to the findings of the archaeologists. The chapter on Euclid contains a typical Sartonian castigation of Plato for his "fantastic speculations" and "aberrations" regarding the regular polyhedra. In the sections on astronomy I feel it is misleading to draw attention to "crudity of observations" in the work of Aristarchus. His treatise gives the data as "hypotheses" which seem most likely to come from some sort of tradition or even sheer supposition rather than any sort of observation.

In the chapter on Archimēdēs and Apollōnios, the account (p. 93) of the evolution of the astronomical theories from homocentric spheres to epicycles and to eccentric circles is highly misleading. One must distinguish between those theories which were an attempt to provide mathematical machinery for predicting the motions of the planets and those which endeavored to give a reasonable physical basis (often nonmathematical) for a model of the planetary system. Apollōnios and Ptolemy are in the first category, Aristotle and Hēracleidēs in the second. The history of medieval astronomy is not therefore a struggle between advocates of epicycles and of homocentrics but the coexistence of theories in the field of mathematical astronomy and in that of philosophical (or physical) cosmology.

Dealing with the earth-measurements of Eratosthenēs, we find again an unwarranted assumption of observation. We do not in fact know what sort of device his gnōmōn was, and it seems more likely that here and with the distance between Syēnē and Alexandria one is dealing with a

tradition based on reasonably good estimates rather than any actual measurement. For the footnote on *Antike Windrosen* (p. 107 n. 27) one should add a reference to the definitive later work of Albert Rehm, *Sitzb. d. Kön. Bay. Akad. d. Wiss.* (Phil-Hist Kl.), Munich 1916.

The second part of the book, having 306 pp., also contains almost equal amounts of history of science and of background material. In the section on the mathematical work of Hipparchos one might feel that Sarton has underestimated the extent of our ignorance of all the work that was superseded by the Almagest. We know that Hipparchos wrote on trigonometry, but not that he was its sole inventor. Ptolemy's chord tables are demonstrably based on a knowledge and accuracy exceeding that claimed and explained in his text; in the absence of preserved tables or text for Hipparchos, we must be more cautious in making moral judgments about his excellent qualities. On p. 287 in this section there is an unfortunate case of footnote numbers being mixed up with indices of mathematical expressions—there is no error but one fears that nonmathematical students might be trapped thereby.

The chapter on astronomy in the last two centuries B.C. is the longest in the book, but alas far from the best. The discovery of precession and trepidation was possible, not because of "relative precision in stellar observations" but through more accurate determinations of the length of the year and the location of the equinox points from which longitudes might be measured. Furthermore, in discussing the length of the year it is the extent of the defect from 365¼ days which is important. It is therefore misleading to say that the Hipparchean value was less than 6½ minutes in excess, when it corrected the 365¼ days by less than 5 minutes; the error remaining was greater than the correction made. Further difficulties in this section are a result of Sarton's steady confusion of mathematical theory and cosmological speculation in the history of astronomy. Keskinto, source of a most interesting inscription (p. 306) which might have been cited more fully, is not "ancient Lyndos" in the island of Rhodes, but a small village nearer to Lartos in that land; this is not a minor quibble, for one of the mysteries of the tablet recording a peculiar planetary theory is that it should have been found in such an isolated small village.

The remainder of this chapter is occupied by a long section dealing with the very important subject of the mechanics of the calendar and technical chronology, and with far less satisfactory discussions of astrology and late Babylonian astronomy. The piece on the calendar is indeed the one really extensive treatment of scientific content of Hellenistic writings in the book, and one cannot but be reminded of Sarton's well-known love for the delicate mysteries of handling dating problems correctly. Many who read these words, and this reviewer too, will treasure letters from Sarton, including at the top some bizarre and esoteric style of dating.

It is no secret that Sarton carried more than customary emotion into his discussion of the subjects of astrology and Babylonian astronomy. For the former subject at least he had a very understandable moral abhorrence of the perverse out-pourings of modern astrological practitioners of astrology. It is a little curious though that he could carry these emotions back to his historical considerations and indulge in so much missionary zeal and "astrologer-hunting" while remaining his usual sympathetic self to bygone mythologies and religions. The technical content of ancient astrology is not only very interesting and hence legitimate of study, but is demonstrably of the utmost importance to the history of astronomy and many other parts of our discipline. Also, to say that "(the Seleucid astronomers) did not develop a coherent astronomical system" is to do grave injustice to the magnitude of achievement of that civilization in building a fantastically sophisticated set of methods of handling astronomical theory by numerical techniques rather than those astronomical ones which through the caprice of history have been more familiar to us in Greek texts.

In the chapters on Physics and Technology I have already noted the lack of sufficient reference to that evidence which has come to us in the form of artifacts rather than of texts. In this connection it is a pity that Sarton does not even mention the complicated geared astronomical machine found off Antikythera in 1900 and published several times since. Such things are important for they should illuminate the diffidence we should all feel in attempting to understand the past merely from studying the eclectic evidence of texts that history has seen fit to preserve.

This is a finely made book, and I have been able to detect in it very few misprints. Only one is really bad, where on p. 382 line 26 has been dittographed into line 23. Of great importance is Sarton's design of this book as a balanced presentation. I feel it is very well done and gives as complete a range of all scientific subject matter and all background material as any one man could achieve. That it could be achieved at all is a miracle brought about by the devotion of a lifetime spent in welding our field into a scholarly unity bound together by Sarton's own great bibliographical *Introduction* and the instrument of our journal, *Isis*.

To answer our original questions, this *History of Science,* as manifested now by two volumes, takes us to a new and more mature level of our field. A reasonably connected account is being written that embodies all the contributions our studies now bring to the rest of the community of scholars. An immediate task is to provide at least those volumes of the present series where we lack any similar connected account. Even while this is being done, we can set about the task, with renewed energy and reward, of providing editions of texts and understanding of past science which may illuminate the areas and details left in the shadow by the wide beam of Sarton's searchlight.

JOHANNES BRAHMS and THEODOR BILLROTH. *Letters from a Musical Friendship.* Translated and edited by Hans Barkan. Norman, Okla., University of Oklahoma Press, 1957. xxi, 246 pp. $5.00.

Reviewed by JEROME P. WEBSTER, *Professor of Surgery, College of Physicians and Surgeons, Columbia University, New York City.*

To those interested in music and medicine and especially to the admirers of Johannes Brahms, the composer, and Theodor Billroth, the surgeon, there is now offered for the first time an English translation of the voluminous correspondence which was carried on for about thirty years between those two giants of the musical and medical professions. Billroth's collected letters, *Briefe von Theodor Billroth,* were first published in 1895, with the ninth edition appearing in 1922. *Billroth und Brahms in Briefwechsel,* the correspondence between these two men, appeared in German in 1935 under the editorship of Billroth's son-in-law, Otto Gottlieb-Billroth, who added numerous explanatory notes. Now Dr. Hans Barkan, a San Francisco ophthalmologist who is an admirer of the music of Brahms and whose father was a student of Billroth, has translated these 331 letters into English, shortening some of Billroth's longer letters, deleting a few of Otto Gottlieb-Billroth's notes, and adding many informative comments of his own to make this volume more interesting to the average reader.

Both men were born in northern Germany, Billroth in Bergen on the Baltic island of Rügen in 1829, and Brahms in Hamburg four years later. With a cultured ancestry, Billroth at an early age became an able pianist and wished to make music his career, but a medical uncle diverted his path into medicine. He was fortunate to secure an assistantship for seven years with the great Berlin surgeon Von Langenbeck, under whom he did outstanding research in the budding specialty of pathology. This brought him early recognition in the surgical world. At the age of thirty-two he was called to become Professor of Surgery at Zürich, where he also found time to ride his musical hobby, write musical criticisms, and visit in the homes of kindred music lovers. He first met Brahms there in 1865, when the lifelong musical friendship and the first of their correspondence began.

Brahms, with a background of a much humbler social order, had a sound training in music and the piano. When only nineteen he toured with the Hungarian violinist, Reményi, during which time he met Liszt through the famous Berlin violinist Joachim, with whom he later toured. He won the admiration and praise of Robert Schumann and began a lifelong attachment to Clara Schumann.

By 1867 both Brahms and Billroth had moved to Vienna where each contributed to making this city the musical and medical center of the world. Here Billroth had been called to become Professor of Surgery, where he trained an outstanding group of surgeons, many of whom later occupied chairs of surgery throughout Europe. With his boundless and untiring energy, his ingenious and daring surgery (made possible by

newly discovered anesthetic agents and aseptic technique), his ability as an inspiring teacher, and his frank and honest statistical reports of the successes and failures of his surgical cases, he became internationally famous as the outstanding surgeon of the world. Despite the many taxing hours spent in the operating room, clinic, and office, interspersed with occasional trips to treat royal patients in the courts of Europe, Billroth, with only four or five hours of sleep nightly, found great enjoyment and relaxation in music.

Like Robert Schumann, Billroth became entranced with the musical compositions of the bachelor Brahms and repeatedly invited him to his home. There, with his wife and daughters and musician friends, frequently including the music critics Hanslick and Kalbeck, many of Brahms' first scores were rehearsed. They vacationed together, climbed mountains together, and discussed music and poetry together. The well-read, romantic Billroth often suggested poems which Brahms set to music. Two of the three Brahms string quartets were dedicated to Billroth, while the third was dedicated to Dr. Engelmann, the Utrecht physiologist.

These delightful letters portray vividly the stimulation, enjoyment, and glowing enthusiasm these two great masters received from their many years of warm friendship that was cemented by the common bond of music. Dr. Barkan has made an excellent translation of this correspondence. The thoughts and expressions of the authors have been ably and happily turned into idiomatic English so as to reproduce the characteristically flowery and poetic style of Billroth and the more telegraphic or staccato letters of Brahms.

In these letters the outgoing surgeon frequently expressed the emotional impact their companionship created in his life. Billroth wrote to Brahms from Vienna on 4 November 1873, "I already owe you many of the most beautiful hours of my inner life," and on 20 June 1880, "That I can keep you and your magnificent art is a life's necessity for me, refreshing and invigorating. Pardon me if I occasionally tire you out." Later (16 Oct. 1888) he wrote, "Your new songs have impressed me and excited me. Magnificent—all are magnificent. What joy there is in these deeply reflecting, sometimes brilliantly shining ornaments." And again, 6 Nov. 1890, "I have lived with you a great part of your being, and you with me. The experiences which bind us together are somewhat like those which tie together the brothers of a good family. Each one of them goes his own way, but they eventually join each other again. . . . I have often reflected on the subject of what happiness is for humanity. Well, today in listening to your music, that was happiness. That I am absolutely certain of."

The more introverted Brahms failed in these letters to give explicit expression to the impression this friendship had upon him. But the man who became the greatest symphony and chamber music composer of his time said to the music critic Kalbeck in 1894 at the funeral of his lifelong friend, the pre-eminent surgeon, "Billroth was attracted to my music at a

time when most people did not wish to hear any of it. This friendship has been a gift of fortune, and his warm enthusiasm has become a necessity to me."

This volume of letters between the celebrated composer and the distinguished surgeon will have a wide human appeal.

WARREN, JOHN COLLINS. *To Work in the Vineyard of Surgery.* The Reminiscences of J. Collins Warren (1842-1927). Edited, with Appendices, Notes and Comments, by Edward D. Churchill, M.D. Cambridge, Massachusetts, Harvard University Press, 1958. ix, 288 pp. $6.00.

Reviewed by GUSTAF E. LINDSKOG, *William H. Carmalt Professor of Surgery, Yale University School of Medicine.*

A FAMILY which has provided distinguished clinical surgeons and teachers to the medical profession uninterruptedly through six generations and two hundred years of American history deserves to be memorialized. Dr. Edward D. Churchill has accomplished this in appropriate fashion by his editorship of J. Collins Warren's previously unpublished reminiscences, entitled *To Work in the Vineyard of Surgery.*

J. Collins Warren, born in 1842, was the grandson of John C. Warren (1778-1856) the surgeon concerned in the first public demonstration of ether anesthesia, and the great-great-nephew of General Joseph Warren, colonial physician and Revolutionary leader, who died on the battlefield at Bunker Hill. J.C.W., as he is termed in Churchill's notes, lived through a generous span of 85 years which encompassed several profound changes in medicine, including the advent of general anesthesia, the aseptic method of surgery, the elective opening of the abdominal and thoracic cavities by the surgeon's scalpel, and the application of physiological principles to clinical problems.

Warren's biographical notes were made available to Dr. Churchill's skillful editorship by Dr. Richard Warren, clinical professor of surgery at Harvard. These reminiscences are concerned chiefly with the world of ideas and the events of a busy professional lifetime and, with characteristic New England reserve, are not disposed to expose the reader to the intimacies of family and personal life. However, with an economy of words and less emotion, J. C. W. was able to evoke a clear picture of an upper class Boston childhood in the Victorian era.

J. Collins Warren matriculated at Harvard College in 1861, and the Civil War erupted in his sophomore year. Family traditions propelled him toward an early enlistment; he was restrained only by the prospect of transferring to the medical courses in his senior year. In the meanwhile he was appointed a medical cadet and spent the winter of 1863 in Philadelphia. As a result of the army's seasonal inactivity, he was able to enroll for the lecture courses of Samuel Gross and Joseph Pancoast at Jefferson Medical College. His notes concerning this period afford some enlightening

comments on the general coarseness, poor living conditions, and meagre educational background of the contemporary medical student, even from the better schools. He lamented that, as at Harvard, the medical school and the hospital (Pennsylvania) were separate physically and administratively. Neither Gross nor Pancoast took their students to the wards. The teaching examples of Montanus at Padua and Boerhaave at Leyden and of Thomas Bond a century earlier had not survived.

Volunteering as an army surgeon in 1864, Warren was shipped to the Second Army Hospital at Pamunkey River, near Richmond, where he helped care for the overwhelming numbers of ill and wounded in the train of Grant's campaign. When the close of the war terminated any need for further military medical excursions, J. C. W. completed the winter term of lectures at Harvard and was then appointed house pupil at the Massachusetts General Hospital, one of two surgical and four medical appointees. His father, J. Mason Warren, was at the time the senior of six visiting surgeons, each of whom devoted four months a year to a service not overburdened with routine duties. Surgery was still concerned principally with the diseases of the superficial and immediately accessible parts of the body. At this point, J. C. W. provides an illuminating account of the primitive hospital facilities, the limited scope of the surgery, and the ever-present spector of lethal wound infection. This was still the era of *laudable pus;* the lessons on wound care taught by Hugh de Lucca and Fr. Theodoric were mouldering in medieval Latin scripts under five hundred years of library dust.

Having obtained his M.D. degree in 1866, J.C.W. began a European "Wanderjahr." Sailing for London, he visited Erichsen, Paget, Ferguson, and Thompson among others, then travelled on to Dresden where he witnessed the end of the brief Austro-Prussian War. In the fall of the same year, he arrived at Vienna during an active epidemic of cholera, which "was no great novelty" to him and "created but little excitement in general."

J.C.W.'s comments at several points in this book indicate that he held a rather low opinion of Continental surgery. Unhampered by the chauvinistic restrictions and the proprietary requirements which hem in certain surgical specialties in America today, the young New Englander enrolled for a course in midwifery! He saw Braun perform numerous Caesarean sections, an operation as yet almost unheard of elsewhere. He listened to von Hebra on dermatology, to von Oppolzer in medicine, and described the latter vividly and flattering in a fine bit of writing. Through the family of John Northrop Motley, the U. S. minister to Austria, he gained access to that brilliant and yet provincial court.

The impending death of J. Mason Warren in August 1867 returned J.C.W. to his paternal home, but following the funeral of his father, he heeded Oliver Wendell Holmes' advice to resume postgraduate studies in Europe. Back once more in Vienna, he became a frequent attendant at the clinics of Theodor Billroth, newly arrived from Zurich. He witnessed

"one of the last battles being waged by a valiant surgeon under the handicap of sepsis." For example, as Churchill's scholarly notes attest, 13 of 36 goiter patients met death after thyroidectomies performed by this German pioneer, largely as the result of infection. Under Biesiadecki, the transplanted Polish pathologist, J.C.W. was initiated into the infant discipline of histopathology. With guidance from this professor, he carried out a small research on keloid formation, which his mentor deemed worthy enough to allow publication.

March of 1868 found the student-wanderer established in Berlin, and he wrote about a succession of famous men: Bernard von Langenbeck (the teacher of Billroth), Rudolf Virchow, and Julius Cohnheim. This was the heady environment which later molded the professional character of another American medical educator, William Welch. In the autumn of the same year, J.C.W. moved on to Paris where Claude Bernard was pursuing his physiological studies upon the sympathetic nerves. Bernard's laboratory neighbor was Ranvier with whom Warren worked and about whom he later wrote: " . . . these congenial surroundings had a ripening effect upon my enthusiasm for the science of surgery which later enabled them to remain alive through a period when the scientific doctor was regarded with some suspicion by his colleagues." This came about as close as J.C.W.'s natural restraint would permit to bitter recrimination of the "old guard" colleagues at Harvard who resisted his subsequent efforts to modernize the department of surgery at that institution.

It was while still in Paris that Warren began to hear rumors about an 'acide phénique' and the dressing of wounds by a new antiseptic method devised by a Glasgow surgeon, Joseph Lister, the harbinger of an "entirely new surgery which was to dispute with internal medicine the right to treat the interior as well as the surface of the body." For this reason, the long-postponed homeward journey to Boston included a stopover at Glasgow as well as London. J.C.W. wrote at some length about his visit with Lister, and referred to it as the crowning event of his student years.

Because of its obvious importance and its determining influence on J. Collins Warren, this reviewer has dwelt at some length upon the rich heritage of European scientific thought and experience which the peripatetic J.C.W. garnered in the three years from 1866 to 1869. Thereafter he settled down at 2 Park Street, the ancestral Warren mansion. He has left us a sympathetic and comparatively detailed description of that house, also most effectively supplemented by the editor's notes and material. After beginning medical practice, Warren was appointed a physician to outpatients at the Massachusetts General Hospital where surgery was still 'external medicine' with the notable exceptions of skull trephining, thoracentesis, excision of bladder stone, and the cure of strangulated inguinal hernia. He was a staunch protagonist, of course, of the Listerian method, the early tribulations of which he described in an interesting way.

J. Collins Warren lost no time in beginning criticism of the deficiencies then existing in the Harvard medical curriculum—lack of organization and graded progression in courses, lack of laboratory space and research, inferior scholastic standards. He set about to correct them, and changes began to be felt with the most fortunate appointment of Charles W. Eliot as president of the University in 1869. Expansion of the professional horizons was associated with long-overdue physical improvements. In 1883 the medical school moved from its gloomy and poor surroundings in North Grove Street to Boylston Street, a sort of neutral ground between the older Massachusetts General Hospital and the younger Boston City Hospital. It is not surprising to learn that the organization meeting to procure the necessary funds for this change was held at 2 Park Street. At that time the total endowment of the Harvard Medical School was less than $100,000 but it rose to about one million dollars by the turn of the century.

Hardly had the Boylston Street plant been occupied when it became evident that further expansion was inevitable. Again J.C.W. played a key role in the formulation of plans and the procurement of the present magnificent group of buildings on Longwood Avenue, even to the point of bearding the formidable financial lion, J. Pierpont Morgan, in his New York den. In company with Warren's friend Henry Bowditch, an interview not longer than three minutes with the enigmatic magnate resulted in a pledge of more than one million dollars. This in turn stimulated an equally munificent gift from the previously dilatory Rockefellers. With the dedication of the new medical buildings in September 1906, the personal memoirs of J. Collins Warren come to a close, as though he felt this might be a fitting climax to a great career. However, the editor proceeds to add further biographical data in an appendiceal chapter, including J.C.W.'s elevation to the Moseley Professorship of Surgery (subsequently held by Harvey Cushing), election to the presidency of the American Surgical Association, and fellowship in the Royal College of Surgeons.

From his own deep knowledge of the biological sciences, medical affairs, and history Churchill has amplified the relatively brief and sometimes incomplete record left by J. Collins Warren with many footnotes, letters, and other materials which help clarify details for both lay and medical readers. Certain of the footnotes are quite lengthy and so provocative of thought that they merit independent reading and consideration. The present writer suggests that the Reminiscences be read through straightway, and then re-examined with particular attention to the footnotes and the three chapters of the Appendix. The last of these appendiceal chapters, entitled "Two Cycles of Medicine at Harvard," presents a great many of the editor's personal views regarding educational problems.

Some readers with an orientation in the direction of New Haven rather than Boston may regret an oversight attributable to both J.C.W. and his editor; among several notations concerning the early ovariotomists

nothing is said of Nathan Smith, Yale's early professor of surgery, who had recorded a successful oophorocystectomy performed in 1821.

In Dr. Churchill's introduction to this important historical work, he states frankly that the original manuscript was quite exciting in parts, but elsewhere dull and tedious. "The entire manuscript cried for radical editing" which J.C.W. had not been able to accomplish before his death on 3 November 1927. The editor is to be congratulated for welding this manuscript and the supplementary material into a very readable and often absorbing story, while remaining faithful to the character and pioneering spirit of one whose prophetic vision, coupled with great energy, helped to catalyze the metamorphosis of a somewhat stagnant provincial medical school into a progressive medical center of world-wide scientific reputation.

N. MARSHALL CUMMINS. *Some Chapters of Cork Medical History.* Cork University Press, 1957. viii, 116 pp. 8s. 6d.

Reviewed by JOHN E. DONLEY, *Director, Department of Labor Curative Centre, Providence, Rhode Island.*

WITHOUT attempting the impossible task of compiling a complete history of Cork hospitals and medical services, which arose and grew under such diverse conditions, Dr. Marshall Cummins here presents a mass of information from many sources which he has diligently collected during many years. He has drawn largely upon unpublished minute books, hospital records, family papers, scrap albums, and newspaper cuttings which sometimes cannot be traced to their source.

In this vividly interesting book, modest in its paper cover, but rich in the spirit and savor of Cork, he presents the result of his labors which show that, as in Dublin, the outstanding contribution of Ireland to the growth of eighteenth century medicine was the idea of the voluntary hospital. In the beginning of the eighteenth century the hospitals of London and of Paris were under Royal or state control; neither state nor monarch showed much charitable concern for the poor—

> The poor whose broken lives
> Lie underneath great empires' pageantry
> Like rubble underneath rich palace walls.

There was a vastly different spirit in Cork, for every chapter of its early medical history is replete with charitable concern for the sick poor who unfortunately were so numerous among the city's inhabitants.

There is a striking parallelism between the story of the Dublin and the Cork hospitals. In 1718 six lowly barber-surgeons in Dublin gave of their meager earnings sufficient to open their Charitable Infirmary, later to become the Jervis Street Hospital, made famous by Dominic Corrigan. One year later the citizens of Cork contributed the funds to establish the

Chamber of Medicine, out of which grew the North and the South Infirmaries as they are known today. On the outside of the North Infirmary was placed the inscription—

NOSOCOMIUM
HOC DEO AUSPICE
FUNDATIUM
ANNO SALUTIS
1720

Should one wish to learn about the sufferings and privations endured by the heroic physicians and people of Cork, he will find rewarding reading in the last part of Dr. Cummins' book. There is the story of the pathetic "climbing boys," mere children, oftentimes waifs, who were employed as chimney sweeps; there is the story of the terrible epidemics which decimated both physicians and laymen, the black death, cholera, smallpox, malaria, typhus fever, and the famine of 1845-1847, which was perhaps the greatest calamity that ever afflicted the Irish race, leaving behind it an Iliad of woes. To the city of Cork belongs the honor of establishing and forwarding, if it did not originate, one of the most extraordinary moral revolutions which the history of the world records, that is, the Temperance Movement, at the head of which was the Very Reverend Theobald Mathew, a Capuchin friar and citizen of Cork. Of this Temperance Movement and its social results Dr. Cummins relates the dramatic story.

Dr. Cummins has provided a moving picture of medical and social conditions in the South of Ireland during the eighteenth and early nineteenth centuries. He has made a significant contribution to the history of medicine in Ireland.

GUSTAV SCHERZ, Ed. *Nicolaus Steno and his Indice.* Copenhagen, Munksgaard, 1958. 314 pp., frontispiece-portrait of Steno in color. (Reprinted from Acta Historica Scientiarum Naturalium et Medicinalium. Bibliotheca Universitatis Hauniensis. Vol. 15.)

Reviewed by the Editor.

THIS admirable volume by seven distinguished Danish authors contains a preface by Gustav Scherz, followed by a long section by Dr. Scherz entitled "Nicolaus Steno's life and work," the first definitive biography of Steno based entirely on original sources. It is in English, as are most of the other contributions. These are as follows: Ragnar Spärck—Nicolaus Steno's contribution to zoology; Rémacle Rome—Nicolas Sténon paléontologiste; Axel Garboe—Nicolaus Steno and scientific geology; Heinrich Tertsch—Niels Stensen und die Kristallographie; Adolf Faller—Niels Stensen und der Cartesianismus; V. A. Eyles—The influence of Nicolaus Steno on the development of geological science in Britain; Gustav Scherz—The Indice

of Nicolaus Steno. This is followed by the text of the *Indice* with a parallel English translation, and textual critical notes.

WILLIAM BROCKBANK. *Ancient Therapeutic Arts.* The Fitzpatrick Lectures delivered in 1950 & 1951 at the Royal College of Physicians. Springfield, Ill., Charles C Thomas [1955]. 162 pp., illus. $5.00.

Reviewed by GENEVIEVE MILLER, *Assistant Professor of Medical History, Western Reserve University School of Medicine, Cleveland, Ohio and Research Associate of the Cleveland Medical Library.*

IN these four lectures Dr. William Brockbank, already well known for his *Bicentenary History of the Manchester Royal Infirmary*, has told "the story of a number of the older therapeutic procedures that had dominated medicine for centuries." These included enema administration, cupping and leeching, and methods of producing counter-irritation, as well as the history of intravenous injection of drugs.

Dr. Brockbank presents his material in most instances with the aid of direct quotations from his primary sources, and his book is thus a valuable guide to the literature. The well-reproduced illustrations from contemporary sources, both in medicine and art, are indispensable to the text.

The author's account includes very little discussion of the rationale behind the therapeutic procedures he treats. This could have been a unifying theme which would have brought greater depth to his subject. For example, the desire to produce counter-irritation, whether by cupping, leeching, blistering, scarification, issues, setons, cauterization or moxibustion, is difficult for the modern physician to understand, since his basic medical theories are so different from those of physicians even a hundred years ago who may have used these procedures. In order to interpret medical ideas of the past and to realize that all physicians before our own generation were not fools, it is important to understand what they thought they were doing by informing oneself of basic presuppositions in their theorizing about the cause of disease and the effect of remedies. We cannot condemn them for not knowing what we know today, and a statement such as "At last a little sense was creeping into the minds of those using this archaic method of treatment [dry cupping], and with the advent of sense its days were numbered" (p. 85) is scarcely justifiable. It would have been more illuminating for the reader to have been given an explicit discussion of why confidence in these methods was shaken so that they were eventually abandoned.

But one cannot blame the author for what he evidently did not intend. These published lectures, as his verbal performance must have been, are anecdotal and entertaining, and the more than ninety well-selected illustrations will amuse and edify the reader.

THOMAS KELLY. *George Birkbeck: Pioneer of Adult Education.* Liverpool, University Press, 1957. 380 pp. 45*s*.

Reviewed by RICHARD D. ALTICK, *Professor of English, The Ohio State University, Columbus, Ohio.*

THE men who worked ceaselessly for social reform in ninteenth-century England came from every middle-class occupation and every profession; and among them doctors were especially numerous and conspicuous. One thinks, for example, of Southwood Smith, friend of Bentham (and eventually, by the great man's will, dissector of his body), co-founder of the utilitarians' *Westminster Review,* and foe of epidemics; of Sir James Kay-Shuttleworth, Poor Law Commissioner, founder of teachers' training schools, and advocate of popular education; and of the most famous—Samuel Smiles, who devoted much of a long and profitable life to encouraging other people to help themselves. A fourth—like the others a product of the University of Edinburgh Medical School, but of a somewhat earlier generation—was George Birkbeck, whose name is indelibly associated with the first great British experiment in adult education, the mechanics' institutes.

Mr. Kelly's exhaustively researched and meticulously documented book is only partly, and secondarily, what the jacket asserts it to be: a biography. He tells us everything that is to be discovered about Birkbeck as a person, but the resulting portrait is indistinct simply because Birkbeck did not leave sufficient personal records to allow a vivid recreation. The impression we do receive of him is mixed. With all his altruism and energy, he was dictatorial, arrogant, vain, humorless—qualities, it should be added, that belonged to a distressing number of his fellow-reformers in the nineteenth century.

During most of his life, Birkbeck—of Yorkshire Quaker stock, then briefly of Edinburgh and Glasgow—was a busy medical practitioner in London, and the wonder is, as his biographer observes, where he found the time for his multifarious activities in scientific and philanthropic societies and enterprises devoted to what was then customarily alluded to as "the diffusion of useful knowledge." But the time somehow was his, and it was not as a doctor but as one of the founders of the London Mechanics' Institution (1825), and subsequently as an adviser and lecturer to scores of such establishments throughout Britain, that he won his early Victorian eminence.

Institutions, Emerson remarked, are the lengthened shadows of individuals. The predominant interest of this book is not the man but the shadow he cast on the population of an emerging industrial country, intent on self-improvement through classes, lectures, and libraries. Mr. Kelly traces, for the first time in such detail, the complicated and not always admirable history of the parent mechanics' institute in London, which set the pattern in more ways than one for the hundreds of other institutes that followed

it. He offers, too, a general history of the movement, as well as an invaluable list (based on research the arduousness of which can hardly be suspected by anyone who has not worked over the same materials) of all institutes of which some record survives before 1851. Because of the wide net he casts, his treatment of the mechanics' institute movement complements, and sometimes duplicates, the equally scholarly book by Mabel Tylecote, *The Mechanics' Institutes of Lancashire and Yorkshire Before 1851* (Manchester University Press, 1957). Almost simultaneously, these two works have adequately covered an important area of nineteenth-century English social history which heretofore had been scandalously neglected.

A. MEIKLEJOHN. *The Life, Work and Times of Charles Turner Thackrah, Surgeon and Apothecary of Leeds (1795-1833).* Edinburgh and London, E. and S. Livingstone, Ltd., 1957. (U. S. publisher: Baltimore, The Williams and Wilkins Co.) 238 pp., illus. $6.00.

Reviewed by the EDITOR.

THIS attractive biography of one of the founders and leaders of the British industrial health movement illustrates in striking fashion an observation of the late Sir Walter Morley Fletcher, that the most vigorous intellectual life of the late eighteenth and early nineteenth centuries in Britain was to be found in the Midlands in centres such as Birmingham, Liverpool, and Warrington, where men like Erasmus Darwin, William Withering, and Joseph Priestley flourished. Had Sir Walter been more familiar with Charles Thackrah and his predecessors, he would undoubtedly have added Leeds to his list. Thackrah is best known for a book published in 1819 under the title *An Inquiry into the Nature and Properties of the Blood in Health and Disease.*

Prior to Dr. Meiklejohn's biography now under review, knowledge of Thackrah's life was based on Henry Yates Whitehead's biographical sketch in the posthumous second edition of the aforementioned monograph published in 1834. Thackrah was familiar with Bernardino Ramazzini's *De morbis artificium diatriba* as translated by a Robert James of Sheffield in 1713 under the title *A Treatise of the Diseases of Tradesmen;* he was also familiar with Patissier's *Traité des maladies des artisans, et de celles qui resultent des diverses professions d'après Ramazzini* (1822) and with the other great classics of preventive medicine published in the early nineteenth century.

Thackrah classified industrial diseases in accordance with their trade. Thus, in the text of the second edition of his book here produced in facsimile he takes up 'machine makers' and remarks that turning of cast iron "is so laborious, that the men can scarcely bear it for the whole of the day. The particles of iron cast off in the process are large and do not consequently affect the lungs in a sensible and great degree." But "draw-filing cast iron is a very injurious occupation." He points out that

the fine iron dust is breathed in by the lungs and causes cough and irritation and expectoration of blackish or blue phlegm. He then goes on to mention lead poisoning among plumbers and house-painters and arsenic poisoning among paper-stainers. 'Gilt button makers' are exposed to the fumes of zinc which cause headaches, giddiness, and loss of appetite, while 'makers of looking-glasses' are exposed to the action of oxydized mercury which causes difficulties, few operatives being able to work for long periods at this occupation, but they survive better if they work on alternate days. Finally, in the author's rather light-hearted discussion of maladies incident to 'practitioners of medicine and surgery', he says that doctors, in his experience, usually enjoy vigorous health and he adds that frequent night calls, thought by the public to be injurious, cannot be so regarded, for he finds obstetricians who for 40 years have been delivering babies at all hours of the day and night generally enjoy the most robust health; then comes this trenchant observation,

> Anxiety of mind does more, I conceive, to impair health, than breach of sleep, nocturnal exposure, or irregularity in meals. The body suffers from the mind. That sense of responsibility which every conscientious practitioner must feel—the anxious zeal, which makes him throw his mind and feelings, into cases of especial danger or difficulty,—break down the frame, change the face of hilarity to that of seriousness and care, and bring on premature age.

He hastens to add, however, that physicians by and large tend to die early. He might have quoted Rabelais' remark that "There be more old drunkards than *old* physicians."

CAROLUS N. LINNÆUS. *Örtabok 1725*. Utgiven av Svenska Läkaresällskapet Till Linnéjubileet 1957 genom Telemak Fredbärj. Stockholm & Uppsala, Almquist & Wicksell, 1957. 320 pp.

CAROLUS LINNÆUS. *Diæta Naturalis, 1733*. På Uppdrag av Kungliga Svenska Vetenskapsakademien Utgiven av Arvid Hj. Uggla. Uppsala, Almquist & Wicksell, 1958. 222 pp.

Reviewed by ADOLPH B. BENSON, *Professor Emeritus of German and Scandinavian Literature, Yale University.*

HERE are two juvenalia by Carolus Linnæus (generally called Linné in Sweden, 1707-1778, the originator of the binomial nomenclature in biology) which have never been published before. Both have been compiled by experts in Linneana and are well done. The first one, *Örtabok* (Book of Plants) was written when Linné was only about 18 years of age, and the second one a short while before he received his M.D. in Holland. The first is compiled from a manuscript at Uppsala, and the second one from a photostat of one in the Linnean Collection in London, which originally,

as is known, acquired most of the Linnean material. The books are written in both Latin and Swedish.

Linné's *Örtabok* deals with about a hundred plants, including grasses, cereals, vegetables, and wild flowers. The manuscript of it is the earliest known by Linné. It is owned by what we may call the County Library of Växjö in the province of Småland, where Linné was born. A photostat copy of it is found at Uppsala University. It is reproduced with meticulous honesty. It was not an easy task: poor or faded ink, inconsistencies in spelling, antiquated dialect terms, and bibliographical references—this was also true in part of *Diæta Naturalis*—provided many difficulties. But doubts about words or interpretations are scrupulously acknowledged. It is, in other words, a reliable work. Lists of plants are given in both Latin and Swedish, and the reviewer suspects that at 18 Linné knew more Latin than the highest form of Swedish. (This would be only natural, of course, considering the custom of scholars at the time.) Incidentally, Latin descriptions of plants are in the notes at the end of the volume reproduced in a free translation in Swedish. Linné gives also (often in Greek) the history of the plant-names from mythological and etymological sources. Great emphasis is laid on the utilitarian value of plants, especially on that for medicinal purposes, culminating later in his two main interests, botany and medicine. The volume is illustrated by woodcuts from the books studied by Linné.

Diæta Naturalis, edited by undoubtedly the greatest living authority on Linné, has only in part before been exploited by other scholars. It throws much light not only on Linné's early thoughts and observations but on Swedish and European thought in general 250 years ago. It is an illuminating combination of divine faith in a Creator of nature, genius, and naivété, and while the editor of the photostat copy of the original has discovered evidences of insufficient schooling and linguistic "carelessness' on Linné's part, he has also revealed Linné's advocacy of the simple life, his sense of moderation, and his profound love of nature. Was his contemporary Rousseau influenced by Linné? Significant is the author's observations on life in Lapland, based on firsthand information of 1732.

The *Diæta* originally consisted of 50, later 70, *regulæ* or rules of dietetics which in the present volume have by rearrangement been increased to 136, with titles in Swedish and Latin and free translations of Latin details in notes at the end of the volume. Here are a few translations of the dietetic suggestions of 1733: a child should not be forced to eat (4); all sudden changes are injurious (9); the air which you breathe should enter through the nose, not through the mouth (13); man is an animal, and should live as an animal of his own kind (26); roasted fish is much better than any other (34). Nor does he like tobacco or hard liquor. The volume is a real contribution.

LUIS SANCHEZ GRANJEL and MA. TERESA SANTANDER. *Bibliografía Española de Historia de la Medicina.* Vol. I. Salamanca, Universidad de Salamanca, 1957. 242 pp. (Publicaciones del Seminario de Historia de la Medicina de la Universidad de Salamanca, Ser. B, vol. 1.)

Reviewed by F. GUERRA, *Lecturer, Department of the History of Medicine, Yale University School of Medicine.*

THIS work of Dr. Granjel, Professor of the History of Medicine in the University of Salamanca, and his associate Miss Santander, a Doctor in Philosophy and Literature, follows the tradition of the basic works in the Spanish medical histories, like Chinchilla and Hernandez Morejón. The 1521 references included cover the books, monographs, and papers published on the history of medicine related to Hispanic nations. In some cases the reference includes a short comment about the quality of the publication and its content.

The bibliography is arranged in alphabetical order by names of authors, and at the end there are indices of biographies, of subjects, and a curious one on pathobiographies, which make the book more useful. This publication of the Seminar of History of Medicine at the University of Salamanca will be extremely useful for the scholars working on Spanish American medical literature, not always easy to find in institutions or libraries.

Although its aim to cover one century since the publications of Chinchilla and Morejón has been achieved in relation to the Spanish publications, some books or periodicals have escaped the research of the authors, particularly those in the New World. However, it is to be hoped that in the second volume, special emphasis will be placed in the review of these publications.

ANTONIO HERNANDEZ ALCÁNTARA. Estudio Histórico de la Obra Toco-Ginecológica y Pediátrica de Damián Carbón. *Publicaciones del Seminario de Historia de la Medicina de la Universidad de Salamanca,* Ser. A: Estudios, 1957, vol. 1, no. 5, pp. 303-388.

FRANCISCO SANCHEZ CAPELOT. La Obra Quirúrgica de Juan Fragoso. *Ibid.,* Ser. A, Estudios, 1957, vol. 1, no. 6, pp. 389-464.

Reviewed by F. GUERRA, *Lecturer, Department of the History of Medicine, Yale University School of Medicine.*

DR. Hernandez Alcántara's doctoral dissertation was published under the direction of Prof. L. S. Granjel. Damián Carbón, a native of Majorca, published the first Spanish book on obstetrics, sterility, and pediatrics: *Libro del arte de las Comadres . . .* Palma de Mallorca, 1554. In a scientific presentation he reveals an advanced knowledge of embriogenic, obstetric, and pediatric problems.

Although the mechanism of parturition was well studied in contemporary books, as Dr. Hernandez Alcántara points out, the value of the work by Carbón lies in his systematic differentiation of the causes of distocis and the way to obtain podalic version. Perhaps more important than the pediatric questions or the study of the diseases occurring in the newborn, are the author's observations on Carbón's pioneer attitude toward a clinical approach to the problem of sterility.

This second publication of the Seminario de Historia de la Medicina in the University of Salamanca, under the direction of Prof. Luis S. Granjel, is a monograph based on the doctoral dissertation of Dr. F. Sanchez Capelot. The study of Fragoso, one of the most celebrated surgeons of the Spanish Renaissance, offers some biographical data and a review of his publications. His anatomical ideas are presented as not showing great influence of Vesalius or Valverde de Amusco, his contemporaries. His surgical procedures are also described with special attention to the chapters on sores and fractures.

Of greater interest is the analysis of the contribution of Fragoso to the medico-legal procedures of surgeons in which he appears as one of the pioneers. A short account is given also of some of Fragoso's miscellaneous publications on therapeutics.

This monograph by Dr. Sanchez Capelot is a good contribution to th study of Spanish surgery in the sixteenth century, when historically it reached its splendour, not only with Juan Fragoso, but men like Hidalgo de Agüero, Daza Chacón, Diaz, and others.

JUAN B. LASTRES. *La Salud Publica y la Prevención de la Viruela en el Perú.* Lima, Imprenta del Ministerio de Hacienda y Comerico, 1957. 244 pp.

JUAN B. LASTRES. *Daniel Carrión.* Lima, Editorial San Marcos, 1957. 147 pp.

Reviewed by F. GUERRA, *Lecturer, Department of the History of Medicine, Yale University School of Medicine.*

DR. J. B. Lastres is well known among the historians of medicine all over the world as the person who took up, after H. Valdizán, the role of keeping active the research on the medical past of Perú. Because of his training in psychiatry, some of his early publications deal with that field, but his most important work is the 'History of Peruvian Medicine' in three volumes published in 1951 at the time of the fourth centennial of the University of San Marcos in Lima (1551). In this work on smallpox in Peru he reviews Jenner's discovery in relation to America and the way that vaccination took place in South America after the famous expedition of Balmis and Salvany in 1803 which brought from Spain wet nurses and children vaccinated with cowpox to be used in Hispanic America as sources of fluid for the spreading of the technique in the Spanish colonies of America and Asia.

Some reference is made to early procedure of inoculation, used in America both in the British and Spanish colonies, and to the development of public health measures in Perú after the Independence during smallpox epidemics. This book of Dr. Lastres, as is true of others by him, has an excellent bibliography, and contains accurate references to contemporary documents which illustrate the smallpox problem in Perú during four centuries.

The second book of Dr. Lastres, is a life of Daniel Carrión, the young Peruvian medical student born in 1857, who died in 1885, 39 days after self-inoculation with a disease that has been the scourge of Perú from historical times up to the present. The sacrifice of Carrión, as Dr. Lastres points out, not only confirmed the identification of the Peruvian wart and Oroya fever as different manifestations of the same infection, but was an example to the medical profession throughout the world of devotion to the cause of public health.

In the preliminary chapters, Lastres, Professor of the History of Medicine at San Marcos University, Lima, Perú, describes the medical ideas and the political environment of the nineteenth century in Lima. The central part of his biography is dedicated to the life of Carrión as a student and to the presentation of his clinical report on the progress of self-infection, ending with Carrión's tragic death and the message to the medical profession.

There is in addition a good historical study of the impact of Carrión's disease, now referred to as *Bartonella bacilliformis* in Peru, with emphasis on the colonial period. The author quotes repeatedly from the Spanish chronicles of the conquistadors, like Pizarro, who were the first Europeans to suffer the infection.

ORLANDO SATTAMINI-DUARTE. *Um médico do Império (O doutor Torres Homen)* 1837-1887. Rio de Janeiro, Irmãos Pongetti Editores, 1957. 186 pp., illus.

Reviewed by F. GUERRA, *Lecturer, Department of the History of Medicine, Yale University School of Medicine.*

João Vicente Torres Homen was the son of a physician and was born in Rio de Janeiro where he lived, worked, taught, and died. Pupil of the baron of Petrópolis, he succeeded him in the old hospital of Santa Casa de Misericordia and the Santa Isabel Infirmary of Rio. Under his tutelage for over twenty years were trained the greatest Brazilian clinicians of the period of the Empire when the Faculdade de Medicina of Rio de Janeiro was probably the finest medical school in South America.

Dr. Sattamini-Duarte presents not only the life but the period of Torres Homen, who was one of the best neurologists of the nineteenth century in South America and who, like Julius Thomsen, suffered from a myotonic

disease. He published the first Brazilian book on neurology and also several books on internal medicine and fevers after his personal experience in yellow fever and cholera. His practice increased his prestige to the point that he was put in charge of the health of the Emperor of Brazil, Pedro II.

This book presents considerable data on the medical life of Rio de Janeiro, and is illustrated with beautiful engravings and anecdotes contemporary with Dr. Torres Homen, which add greatly to the interest of the book.

ZACHARY COPE. *Florence Nightingale and the Doctors,* Philadelphia, J. B. Lippincott Company, 1958. 163 pp. $5.00.

Reviewed by ELEANOR LEE, *Associate Dean of Nursing, Faculty of Medicine, Columbia University, New York City.*

THIS book presents material from letters written to Miss Nightingale by doctors and from her replies. Her great influence upon mid-Victorian medicine is evident in the well-selected quotations.

In his brief account the author has succeeded in presenting clearly and in a most interesting way Miss Nightingale's attitude toward the medical profession and her relationships to individual doctors in their joint efforts to bring about medical and sanitary reforms. From her first position as superintendent in Harley Street hospital and still more from her Crimean experience she had learned a great deal about medicine.

As the chapters unfold, her close association with certain well-known doctors and distinguished statesmen is revealed, as well as her ability to influence them to assist in achieving her aims and to concentrate on matters in which she was interested.

She met her close colleague and adviser for over thirty-five years, Dr. John Sutherland, on his arrival at Scutari, 6 March 1855. He had had experience in public health and was sent out to investigate sanitary conditions. It was from him that she gained all of her knowledge of sanitary science.

After her return from the Crimea Miss Nightingale occupied an interesting and influential position dealing with various aspects of Army reform. Dr. Sutherland was a member of the Army Sanitary Commission and also the Royal Commission in India. He acted as confidential secretary to Miss Nightingale and, working together, they achieved great things. During this period many problems were presented to her from all over the world such as construction of hospitals, training of nurses, and sanitation problems. She showed herself to be forward-looking and years ahead of her time, and was the power behind many progressive reforms.

Another long friendship started in 1855 at Scutari when Sir John McNeill, a noted surgeon, undertook the mission to investigate the delay in transporting and distributing provisions and clothing in the Crimea.

After Miss Nightingale's return to England, Sir John was of great assistance to her in her précis of evidence for the Army Sanitary Commission. Also she frequently consulted him about the school of nursing which she proposed to start at St. Thomas's Hospital.

During all of her life Miss Nightingale was interested in figures as well as facts. She became most enthusiastic about the value of statistics, and her interest in hospital statistics continued for many years. She asked the help of a medical statistician, Dr. William Farr, in preparing some statistics on the health in the Army. Miss Nightingale valued the friendship and her correspondence with Dr. Farr on a number of important matters. He wrote for the *Lancet* and contributed articles which Miss Nightingale had sent him. In 1858 at Dr. Farr's recommendation she was elected a member of the Statistical Society.

Florence Nightingale is best known as the founder of the profession of nursing, and her interpretation of nursing to her medical colleagues was the most significant contribution of her life. The opportunity to reform nursing had been provided by the national gift of the Nightingale Fund presented to her on her return from the Crimea. The school was founded at St. Thomas's Hospital in 1860 with Miss Wardroper as matron and was administered by a Council of the Nightingale Fund of which four of the nine members were doctors: Sir James Clark, Dr. William Bowman, Sir John McNeill, and Dr. Bence Jones. None of these doctors belonged to the staff at St. Thomas's but many references are made to them throughout the book because of their close association with Miss Nightingale's life and work.

This book is a valuable addition to the literature about Florence Nightingale.

COLUMBIA UNIVERSITY. College of Physicians and Surgeons. Department of Nursing. *Catalogue of the Florence Nightingale Collection.* New York, 1956. 79 pp. $2.00. [Columbia University Press (Lithoprint)]

Reviewed by the EDITOR.

THROUGH the generosity of Dr. Hugh Auchincloss and the work of a succession of nurses and friends, the Presbyterian Hospital School of Nursing has brought together a Florence Nightingale collection of letters, portraits, books, and memorabilia of which they are justly proud. There have been two earlier brochures calling attention to this growing collection, but this present *Catalogue* is by far the most ambitious. In 1953 the Florence Nightingale International Foundation "decided to sponsor the compilation of a Bibliography of Florence Nightingale together with a Calendar of her extant letters"; four years later Mr. W. J. Bishop, who is in charge of the undertaking, was able to report (*International Nursing Review,* 1957, *4,* 64-67) that he had examined more than 6,000 letters. To this project the

Presbyterian Hospital School of Nursing had been able to contribute over 250 pieces.

The *Catalogue* is arranged both chronologically and alphabetically with a rather full digest of the contents of the letters being given in each case. This is most welcome and will prove useful to anyone seeking particular facts about Miss Nightingale. It is, however, a little disconcerting to discover that these analyses have all been repeated *in toto* in the section of alphabetical arrangement when a good name index would have taken care of this phase quite adequately. In spite of various shortcomings, it is good to have a record of this splendid collection and, incidentally, a clear indication of the interest and devotion of many persons who worked to bring it together and to make it easily and attractively available to all who are interested in Florence Nightingale.

[William Osler.] *The Student Life. The Philosophy of Sir William Osler.* Edited by Richard E. Verney. Edinburgh and London, E. & S. Livingstone Ltd. (The Williams & Wilkins Co., Baltimore, exclusive U. S. agents), 1957. 214 pp. $4.00.

Reviewed by John Keith Rose, *Rockefeller Institute of Medical Research, New York City.*

Sir William Osler died forty years ago and only a small group of men is living who knew him well. They need not go to his writings to appreciate that great physician, but all others do, and no one maintains a more gently critical attitude than the modern medical student. Such disrespect most often stems from the students' inability to appreciate the significance of Osler's frequent references to the personalities of the classics and this, say Sir William's contemporaries, reflects the limitations of our schooling. But our educational processes are not the issue; the author could not remedy readers' deficiencies so he documented the text instead.

Richard Verney never knew Osler but has long been an admirer; he has worked in the department of student health at the University of Edinburgh for a generation. This book, an anthology of Osler's writings, groups parts of essays and addresses into chapters concerned with student life, clinical years, collection of a library, and the like; most fortunately, a separate chapter presents *A Way of Life* in its entirety. Dr. Mary Moss supplied the detailed footnotes that both refresh the memory and inform the ignorant; the editor has inserted marginal notes which present the essence of the text.

Mr. Verney's volume should become the companion of all our medical students from their earliest days of matriculation; Osler's philosophy and some of his personality stand unencumbered, and it should spur many to return to the originals. This, after all, is the purpose of the book.

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